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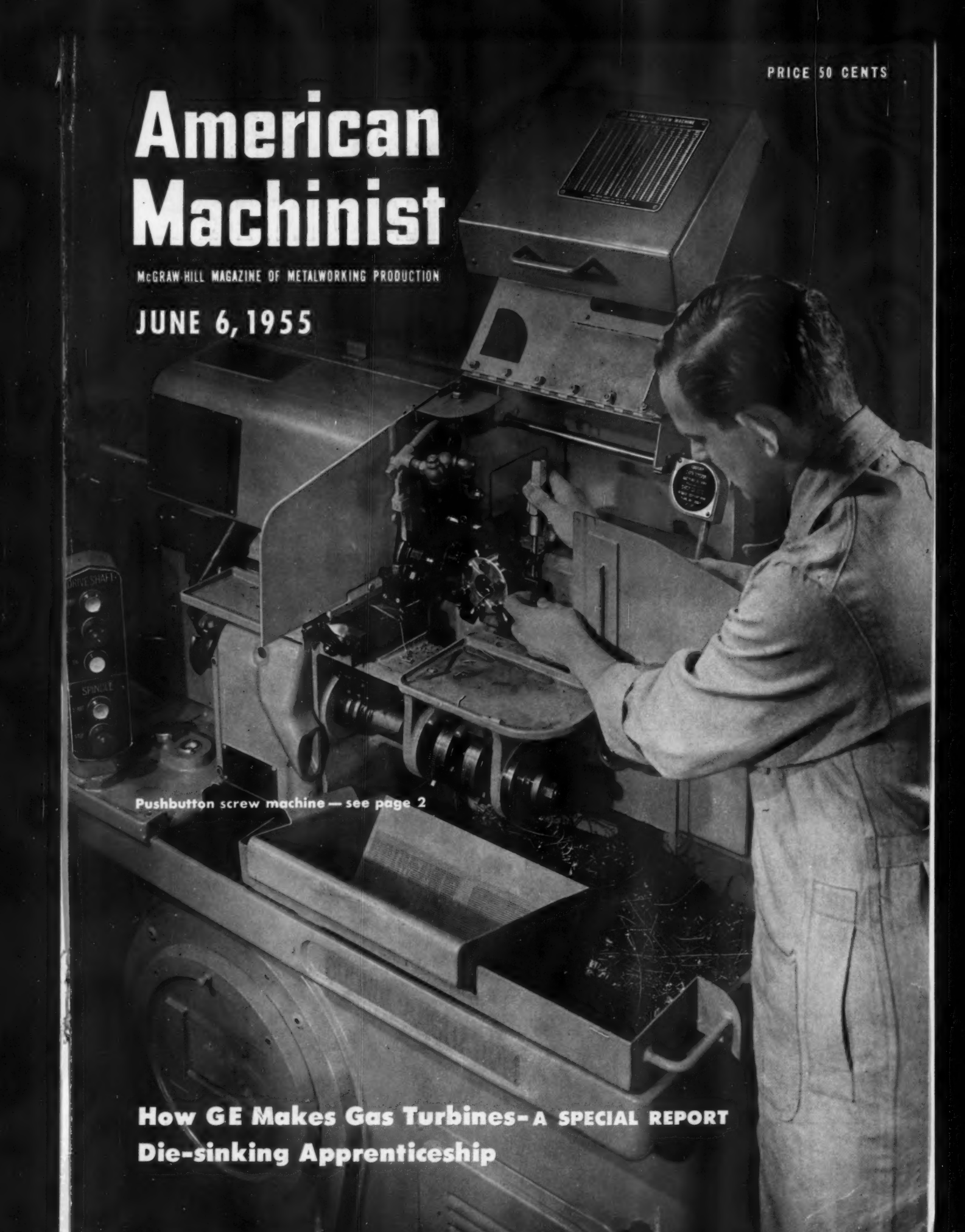
American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

JUNE 6, 1955

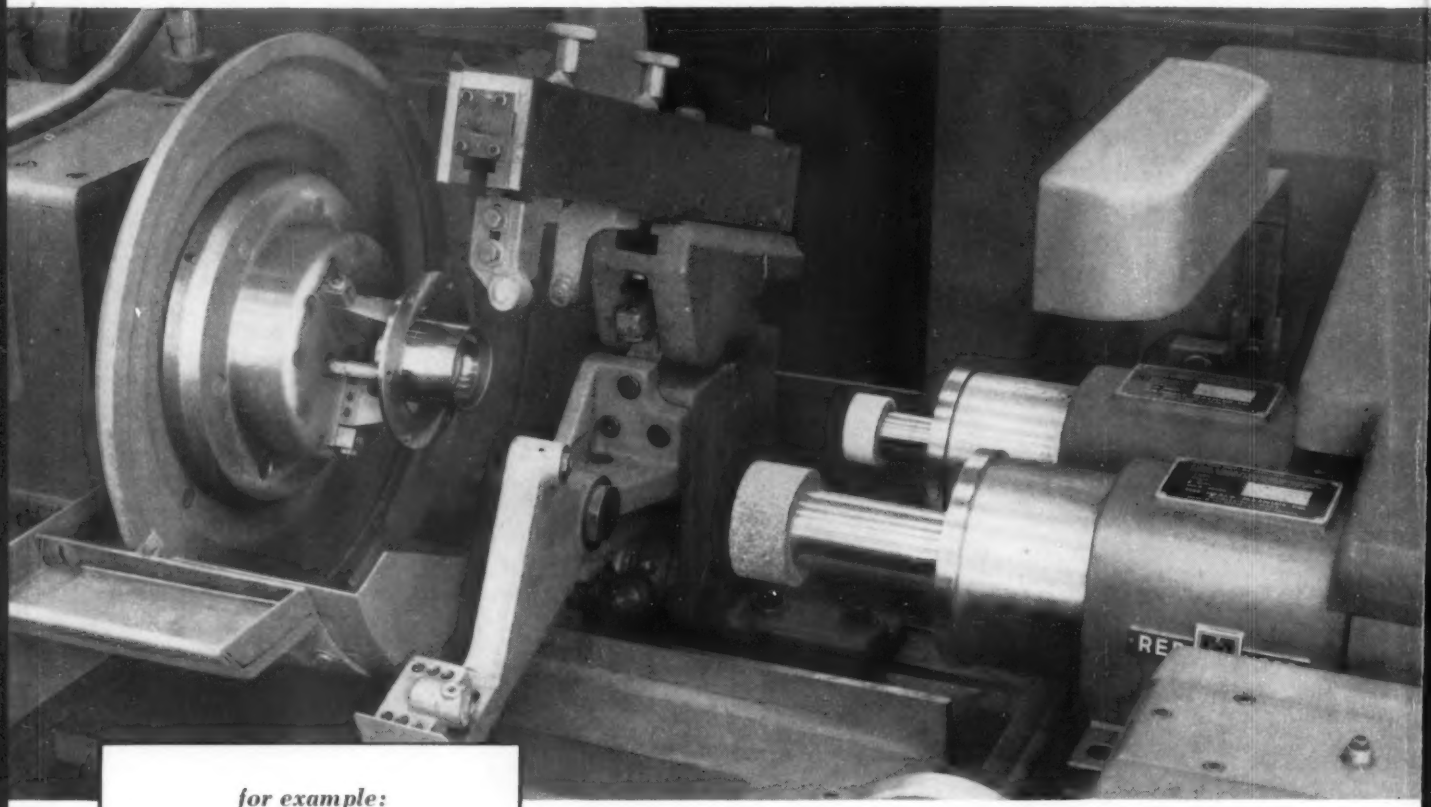


Pushbutton screw machine — see page 2

How GE Makes Gas Turbines—A SPECIAL REPORT

Die-sinking Apprenticeship

how to convert handling-time into grinding-time with a TWO-SPINDLE HEALD INTERNAL



for example:

This Model 271 Size-Matic grinds

SIX DIFFERENT SURFACES

at a single chucking

Finish grind I.D.—plunge grind bottom face—plunge grind hub face—finish grind O.D. — plunge grind flange face — finish grind flange O.D. *All* of these operations are done, at a single chucking on the Model 271 two-spindle internal shown above. And by reversing the part in the chuck, the same operations (except flange O.D.) are done on the opposite end — a total of 11 different surfaces on one part in one machine!

Fourteen identical machines are used by one manufacturer to grind 34 different gears and gear hubs, with interchangeable workholding fixtures. That's Heald *versatility* in action.

THERE'S no profit in handling-time. Loading and unloading—transferring parts from one machine to another—serve only to cut down the overall efficiency of any precision production operation.

Whenever you can combine bore and face grinding — or bore, face and O.D. grinding—on a two-spindle Heald internal, you convert handling-time into actual *grinding-time*. That means faster, more efficient production by performing two or more operations on a single machine, at a single loading. Moreover, concentricity and squareness between Heald ground surfaces are automatically held to extremely close tolerances.

The versatility of Heald two-spindle internals permits a wide variety of parts to be precision ground on I.D.s, O.D.s and faces in a high-speed, fully automatic cycle. Your Heald representative will be glad to show you how a double-spindle machine can cut costs on your multiple-surface grinding jobs.

it PAYS to come to Heald

Booth 902

AT THE MACHINE TOOL SHOW

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Vol 99, No 12

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NUMBER OF COPIES PRINTED THIS ISSUE 38,497

chips

PUSHBUTTON . . . Our cover pictures a "Show Year" development in the #00 Brown & Sharpe automatic screw machine—pushbutton control of both spindle and driveshaft speeds, including jogging for setup. Chip area has been doubled, as on many recent production-tool designs. Spindle speed now tops at 7195 rpm in preloaded bearings. There are 18 high speeds, with each of which any of 13 low speeds can be used. Stock up to ½-in. dia can be handled, for turning lengths of 1 in. with 240 rpm on the driveshaft and 1½ in. with 120 rpm. Eleven change gears replace the former 62; there is no leather belting; slideways are detachable, hardened and ground. For details, see our "New Shop Equipment, Materials & Parts" section, where several other radically new tools are also shown.

SELF-RESETTING . . . Recently we reported the first self-resetting lathe, have spoken of self-resetting boring machines and self-gaging grinders. Now our two lead articles show how the principle has been applied to gear hobbing—with a gaging unit that is simply plugged in. Either one or multiple spindles can be controlled—the latter with a "memory." Because of the new engineering principles, we thought you'd want detailed treatment. Note particularly that idea of double limits—inner ones to anticipate tool wear, outer ones for sorting. Here the shop begins to take over on specifying tolerances closer than those on the prints. What's more, inspection becomes a control for a machine tool rather than a subsequent process. And automation moves steadly forward.

GAS TURBINES . . . Several months ago, we visited GE's plant where industrial gas turbines are built. There were so many ingenious, inexpensive, and broadly applicable tricks in machining and forming stainless and other materials (see biog) that we thought you'd want to see them too. Hence our current 16-page Special Report.

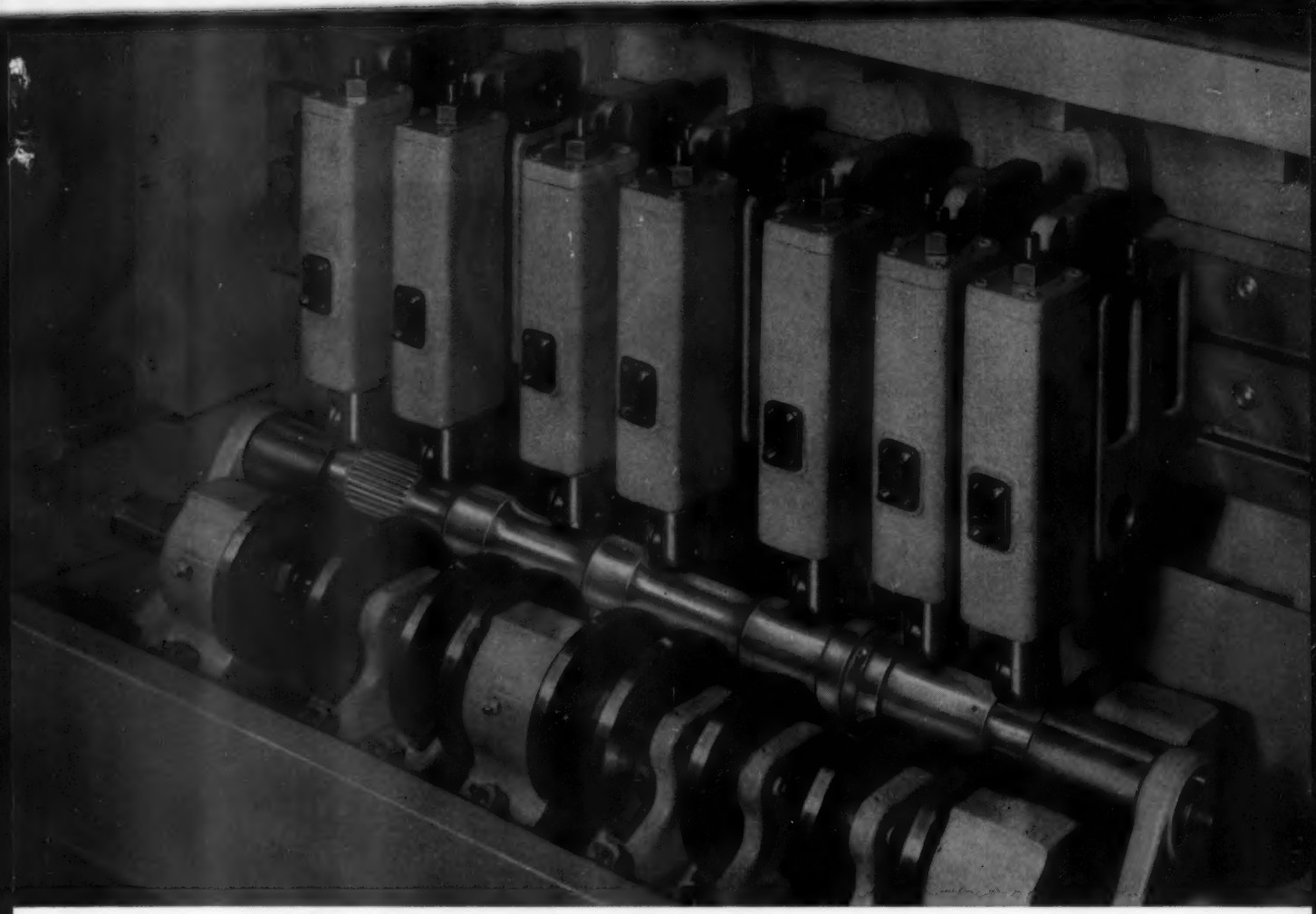
DISPOSABLE MILLING CUTTERS . . . Horace Frommelt brings news of a milling cutter with powder-metal body. The vibration-free character of the powder metal permits higher speeds with longer tool life, while the thin cast-in-place carbide teeth make it cheaper to throw away the cutter than to regrind.

EIGHT LONG YEARS . . . In the face of current cries that men will not apprentice themselves for four long years, we bring you the story of Cleveland's program for die sinkers—which takes twice that long. . . . Also for management perusal is a simple and effective method of keeping tabs on cost and production time on individual orders in a job shop. The paper work is minimized, as it should be.

TOOLING. . . In addition to our cover, lead article, Special Report, and descriptions of surprising new machine tools, we bring you several additional tooling articles. There is a series of pictures showing ultrasonic machining; a 2-turret, 2-tracer T-lathe; a tilt-leg bandsaw; and magnets for locating steel stock in a die. . . .

COMING . . . June 20 *AM* will include a Special Report on plug and ring gage policy, plus articles on free-machining steels, assembling aluminum manifolds, welding low-alloy steels, centralized production control, calculating nose radius on a tool, and automatic drilling.

TURBINE BUILDER . . . George V Keller is manager of manufacturing engineering in the Gas Turbine Dept at General Electric. Born in Charlotte, NC, he received his degree in electrical engineering at NC State and joined GE as a test engineer in 1927. A succession of jobs since has taken him up through the supercharger div, the Schenectady Works, the Lynn River works, and the aircraft gas turbine plant at Evendale. He has been in the Gas Turbine Department since 1949, reports on this operation in our current special report.



How to eliminate *your* shaft distortion problems

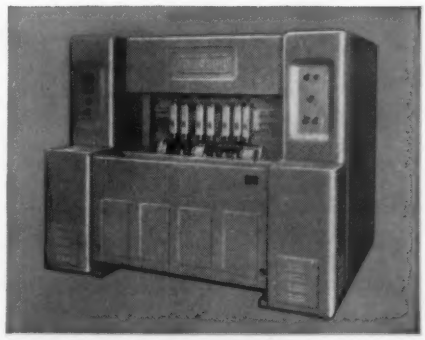
Distortion during hardening is a major production problem.

The Gleason No. 140 Rolling Quench Machine corrects this difficulty, because the quenching and straightening operations are performed at the same time. Because cold straightening is eliminated, valuable production time and expense are saved, and the quenched parts have less residual stress.

Shafts cannot distort because they are rolled under pressure throughout the quenching operation. The operator puts the hot part on the lower rollers and starts the machine. From there on, the quenching operation is automatic. Rolling speed, pressure, and oil flow are pre-set to suit the work that is being quenched.

The automatic quenching cycle saves operator time, and gives *uniform* results for all parts quenched. The pre-set metallurgically correct oil flow gives uniform hardness.

The Gleason No. 140 Rolling Quench Machine is equally suited for small or large quantities. It accommodates shafts $\frac{9}{16}$″ to 4″ in diameter, 6″ to 40″ in length, with integral cams or shoulders up to 8″ diameter. Tooling can be arranged to hold parts on diameters or centers. Unusual shapes can be handled with additional tooling. Write for further information.



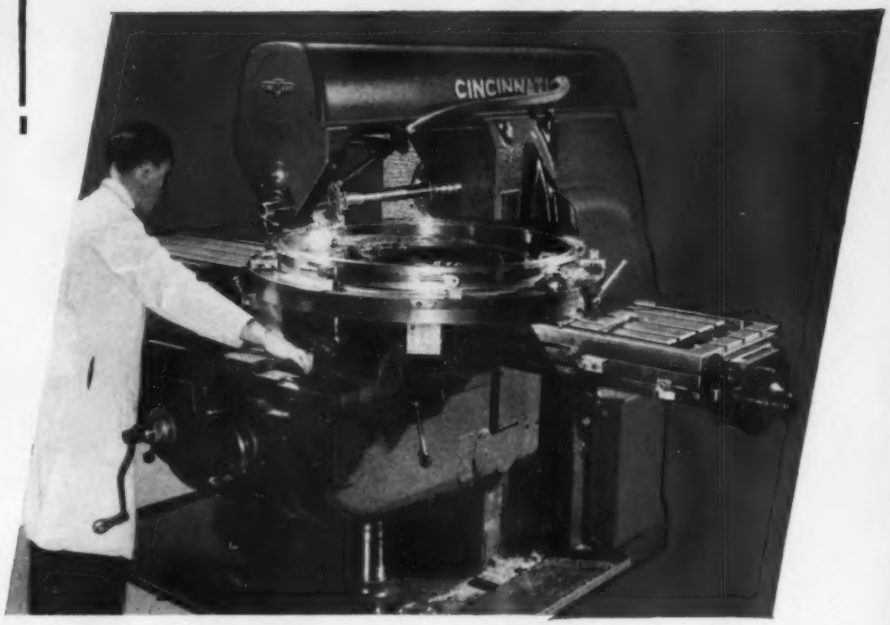
The Gleason No. 140 Rolling Quench Machine also handles multiple quenching of short shafts.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

1000 UNIVERSITY AVE., ROCHESTER 3, N.Y.

RANGY!



Plenty of range for milling the large parts. No. 6 Plain High Power Dial Type illustrated: 60" longitudinal travel, 14" cross travel, 20" vertical travel, 27" max. face of column to center tee-slot.

FAST!

CINCINNATI

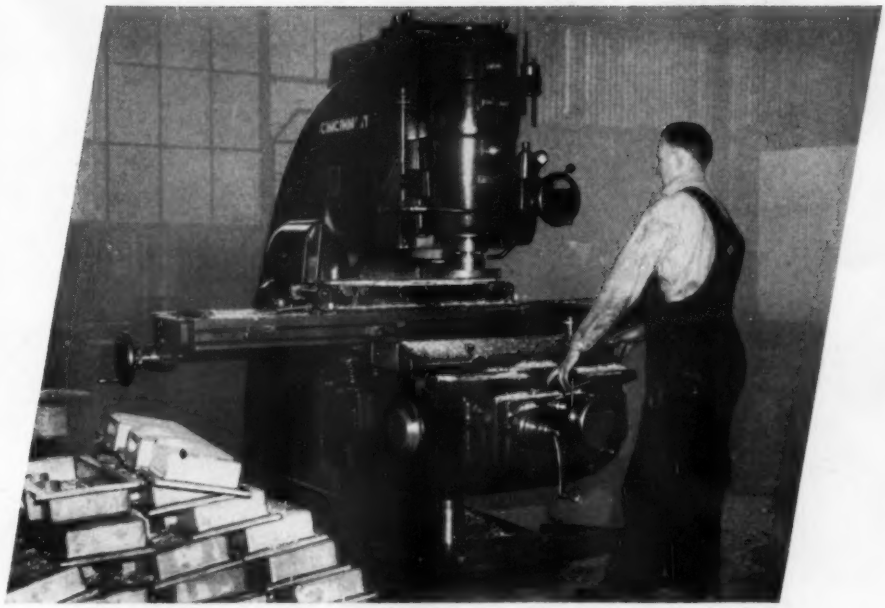
High rates of speeds and feeds for milling aluminum; low rates, too, for steel and cast iron. No. 5 Vertical High Power Dial Type illustrated: 32 feeds 3/8" to 90" per minute; 24 spindle speeds 14 to 1400 rpm. (16 to 1600 rpm for the Nos. 3 and 4 sizes)

Every shop needs rangy, fast, powerful knee-and-column type milling machines. CINCINNATI High Power and Dual Power Millers fulfill all your requirements for equipment of this type. They are available in Nos. 3, 4, 5 and 6 sizes, plain and vertical styles, and some sizes in universal styles. Brief specifications in Sweet's Machine Tool Catalog. Complete information may be obtained by writing for literature: High Power Dial Type, catalog No. M-1644-4; Dual Power Dial Type, catalog No. M-1647-2.

THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO

CINCIN

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING



MACHINE TOOL SHOW
INTERNATIONAL AMPHITHEATRE
CHICAGO, ILL.
SEPT. 6-17, 1955

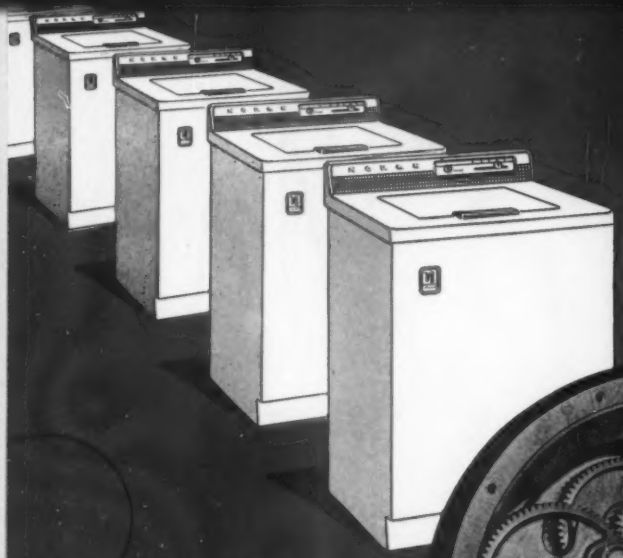
BOOTH 1205

Powerful!

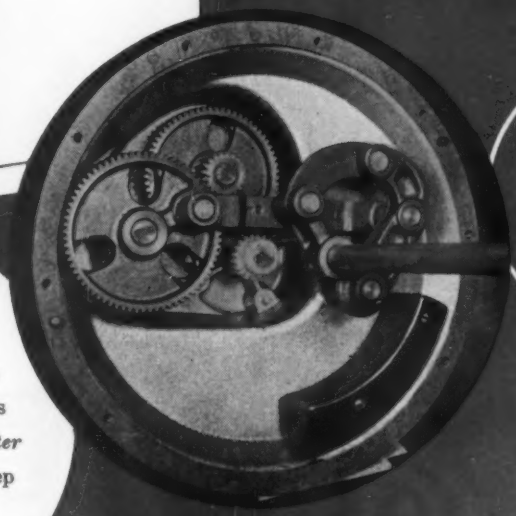
50 hp cuts, up-milling or down (climb) milling, can be taken on the Nos. 5 and 6 Dual Power Dial Types. Deep, square knee-column gibbing, yard-wide knee, Dynapoise overarm and automatic backlash eliminator combine forces to smooth the way for the heaviest cuts.

NATI

MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID



TO STIMULATE NORGE



QUALITY of these transmission gears which drive the agitator keeps mechanical operation *quieter* longer... helps to keep housewives sold on Norge.

QUALITY gears in quantity are economically produced by this battery of Fellows 7-Type Gear Shapers and No. 8 "Full-tool" Gear Shavers. Borg-Warner uses Fellows No. 8M Red Liner for inspection.

THE *Fellows*

SALES . . . . . *Borg-Warner cuts, shaves and inspects ALL gears by the Fellows Method*

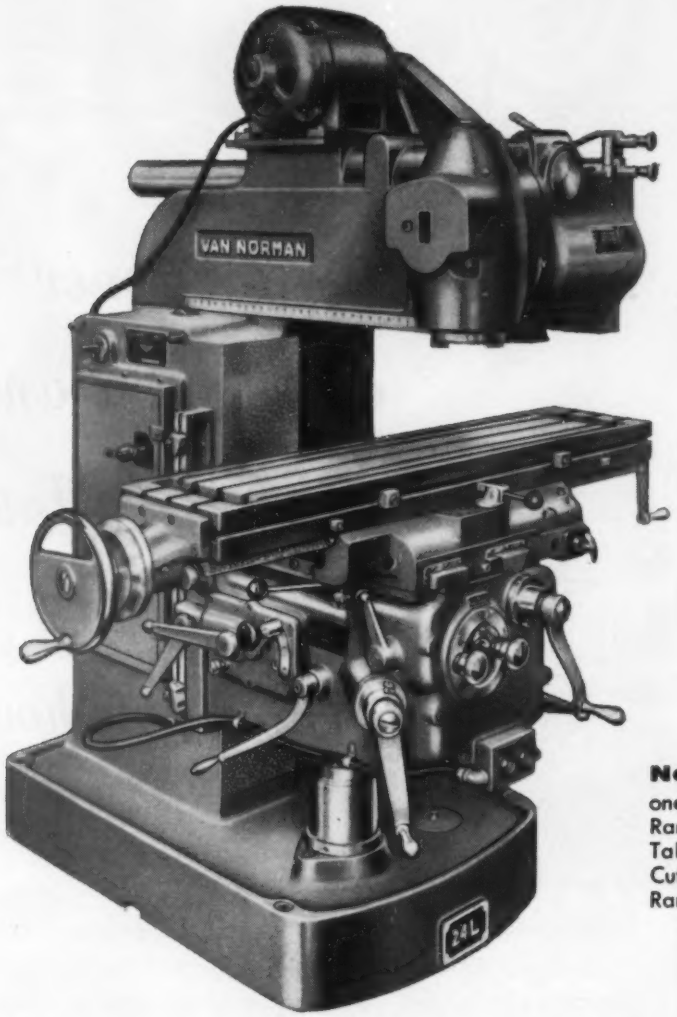
Because "STAND-UP" QUALITY builds reputation...Norge Division of the Borg-Warner Corporation selected Fellows Gear Shapers, Gear Shavers and Inspection Instruments to procure positive control over the quality of the gear trains in their "Time-Line" Automatic Washers.

All transmission gears that drive the agitator are cut and shaved to close dimensions...even the small nylon pinion is cut by the Fellows Method. Result: Norge's mechanical operation is quiet when the machine is new and stays quiet...and the housewife gets many extra Mondays of service life.

Fellows Gear Shapers also give extra benefits in terms of great flexibility and production economy. When looking for a better way to produce *quality gears in quantity*...why not follow the example set by so many of America's Leading Manufacturers? Talk over your gear production problems with a Fellows Representative. Also, you might be interested in getting information from him about the Fellows Plan for Deferred Payment.

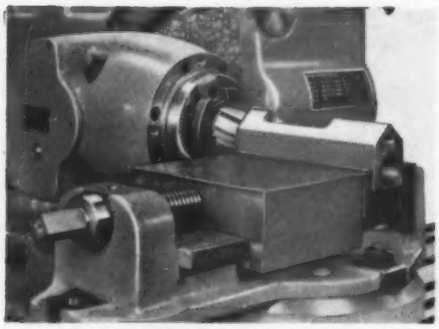
GEAR SHAPER COMPANY

Head Office and Export Department: 78 River Street, Springfield, Vermont.
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39
2206 Empire State Building, New York 1 • 6214 West Manchester Avenue, Los Angeles 45

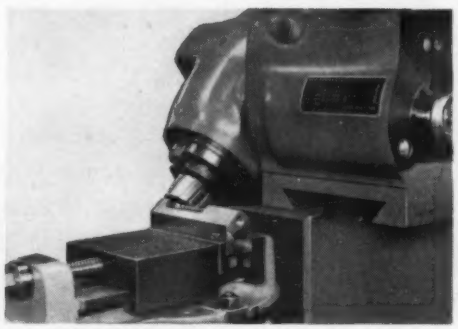


No. 24 L...
one of 10 new Van Norman Ram-Type Millers.
Table Size: 45″ x 10½″
Cutterhead Motor: 3 HP
Ram Travel: 29″

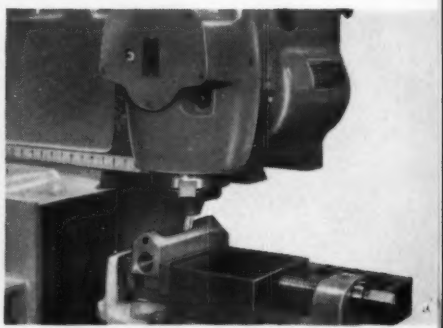
Here's how you eliminate idle machine time by as much as 50%...increase production



HORIZONTAL — A typical horizontal milling operation performed on the new Van Norman Ram-Type Miller.



ANGULAR — An angular milling operation performed on the same workpiece. Note workpiece remains in the same set-up. Angular range of cutterhead 0°-90″.



VERTICAL — With the cutterhead locked in vertical position a slot is milled in the workpiece. Note the set-up has not been changed.

VAN NORMAN

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

You Don't Need TWO Single-Purpose Machines plus Attachments when ONE VAN NORMAN Ram-Type Milling Machine Does the Same Work at Lower Cost

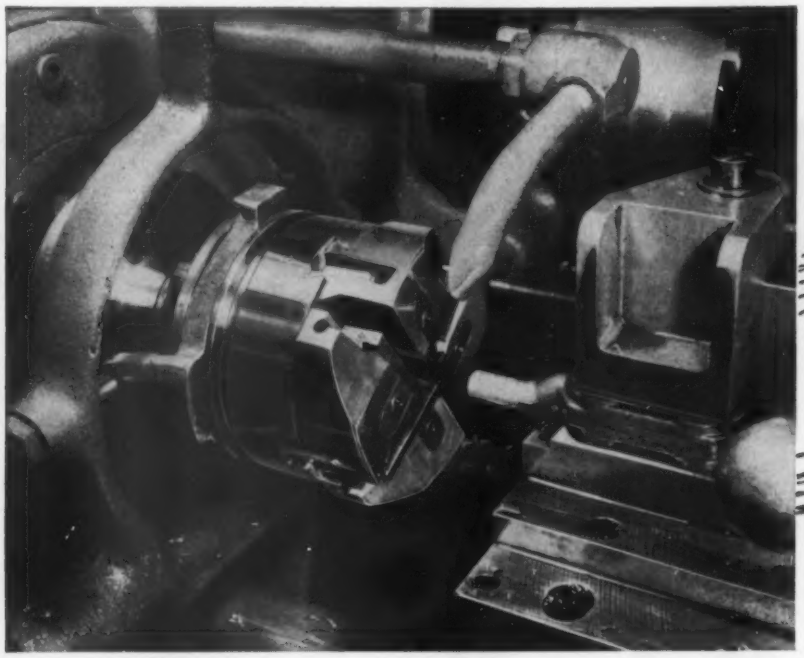
A single investment in *one* Van Norman Ram-Type Milling Machine gives you the equivalent of two separate millers plus attachments at the much lower cost of a single machine. Not only do you save machine purchase dollars, but with a Van Norman you get increased production with substantial savings in milling costs.

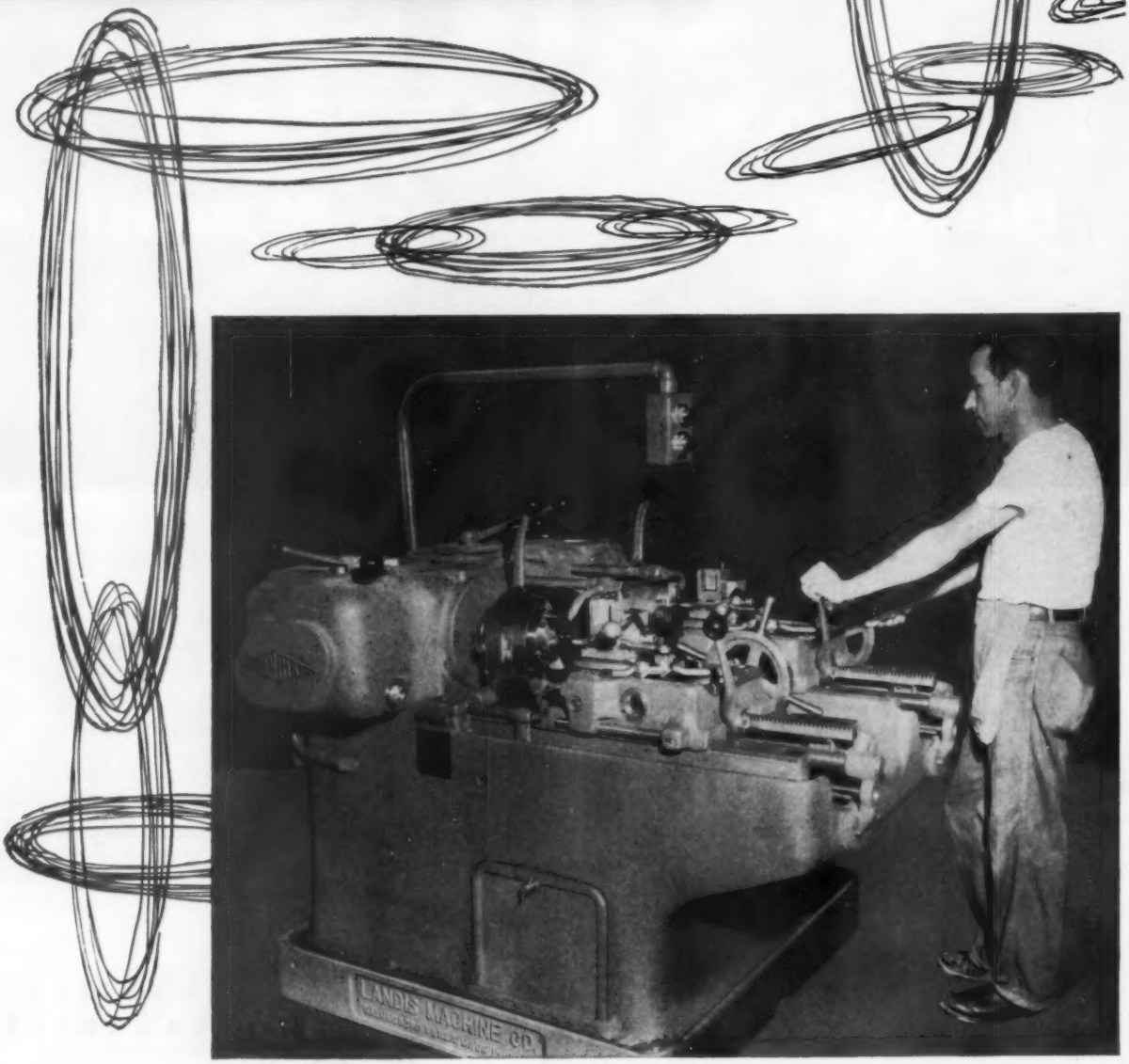
10 new models with cutterhead motors ranging from 1½ HP to 10 HP and table sizes from 37½″x 9³⁄₁₆″ to 64″x 14″ give you a wide range of selection. Write for complete information today.

Don't wait . . . for extra profits install a Van Norman Machine now! They are available on five purchase plans — Outright sale . . . Purchase on conditional sales contract up to 5 years . . . Pay as you depreciate . . . Straight lease . . . Lease with option to buy. See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.

COMPANY | SPRINGFIELD 7, MASSACHUSETTS




LANDIS MACHINE CO

FASTER TURNING

Using 4 Cutting Tools

SIMULTANEOUSLY

Automotive parts production at Thompson Products in Detroit has been substantially increased by turning, facing, and chamfering on Landis Threading Machines. This LANDIS **Hollow Milling** technique makes large out-put increases possible by applying a number of simultaneously-functioning cutters, thus multiplying the feed rate of a single tool.

The illustrations show one of these parts, steering links, being turned and faced on a LANDMACO Double-Spindle Leadscrew Threading Machine. SAE 1040 steel forgings are turned (1/32" stock removal) 1⅛" in length and faced by four special turning cutters in ⅞" V LANCO Hardened and Ground Heads. Production regularly averages 200 pieces per hour, with the ⅝" turned diameter held within ±.004". Four hours production is obtained between cutter grinds.

This LANDIS technique offers important advantages over other methods of turning, forming, and facing. The use of four or six simultaneously-functioning cutters, in addition to increasing production, reduces tool cost and workpiece spoilage to the minimum. The diametrically-opposing cutters evenly distribute cutting strains and maintain proper work alignment. LANDIS Cutters, available in a wide variety of styles, are economical for they are usable for most of their length with only a simple regrinding of the rake angle.

Additional information will be sent on request—please include specifications when writing.

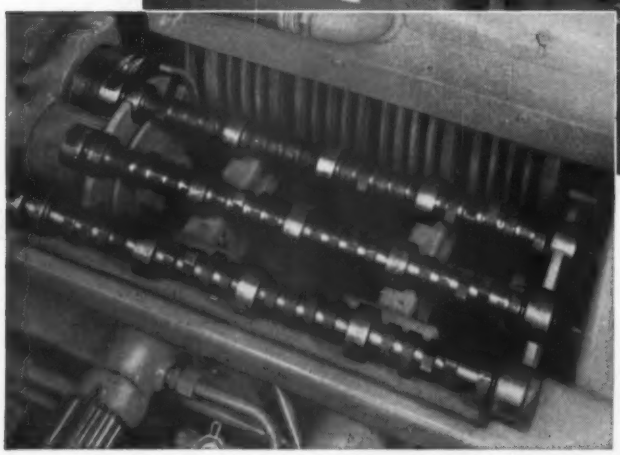
THE WORLD'S LARGEST MANUFACTURERS OF THREAD GENERATING EQUIPMENT

LANDIS Machine CO. WAYNESBORO PENNSYLVANIA

BN2-C

Landis automation . . . first in

1935 **Landis automation for camshafts**



Landis automation for camshafts grinds automatically. The year: 1935.

LANDIS

automated

precision grinders

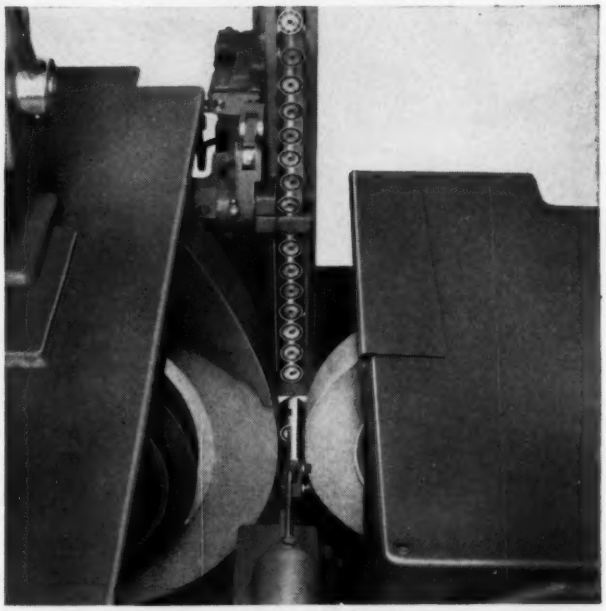
first in automation since 1935

LANDIS TOOL COMPANY

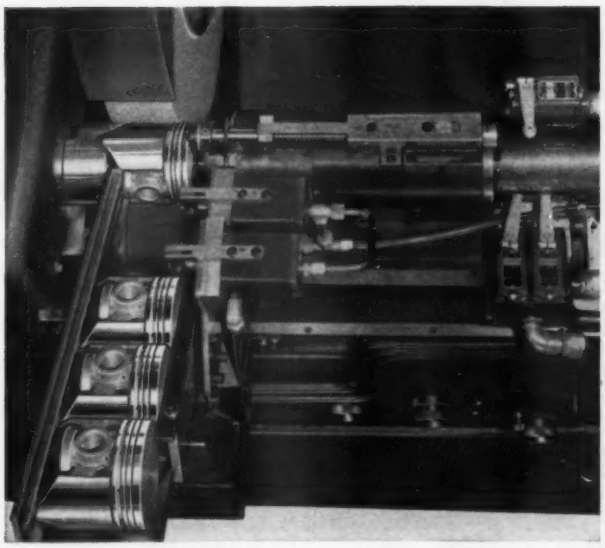
cutting grinding costs automatically

TODAY Landis automation for a wide variety of work

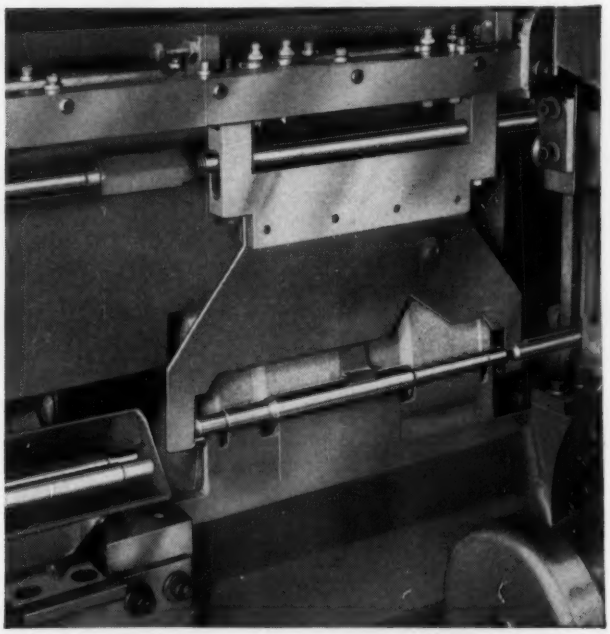
Landis automation for valves



Landis automation for appliance parts



Landis automation for pistons

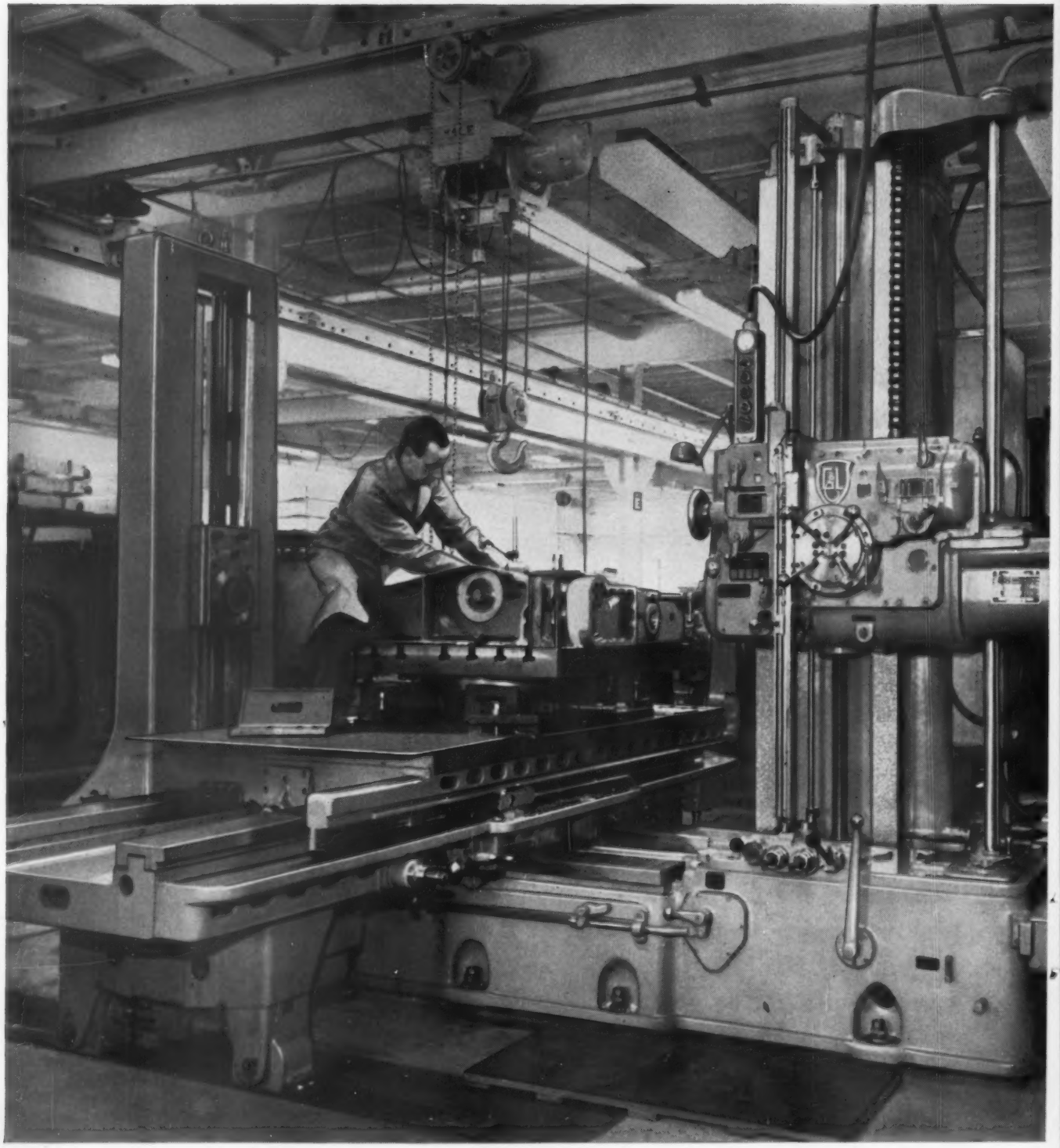


Landis automation for many other parts

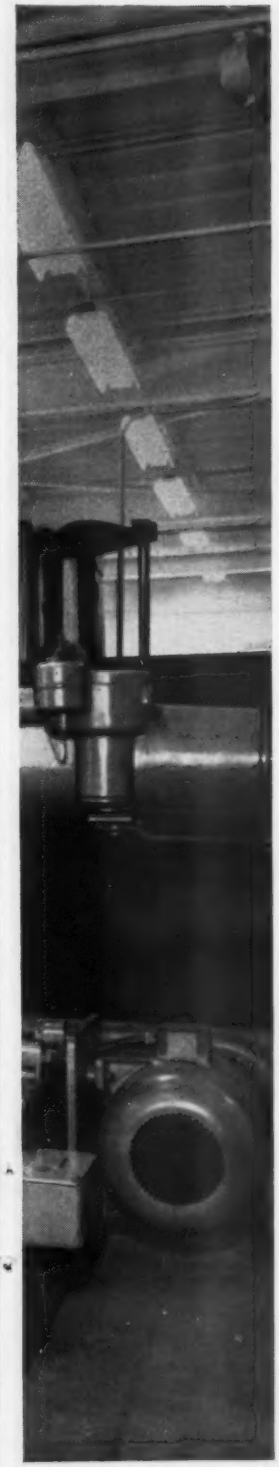
WAYNESBORO, PENNA.

Stacy Machine Works Inc. reports:

"This machine is the



pride of our shop"



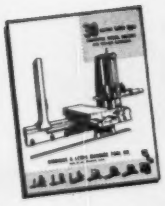
Here's production without rejects... precision boring within .0005"... and alignment and squareness to .001"... all accomplished on a G&L Model 340-T Table Type Horizontal Boring, Drilling and Milling machine with an Automatic Electric Positioning Device

Here's what a company executive of Stacy Machine Works, Inc., Agawam, Mass. said about their Giddings & Lewis Model 340-T Horizontal Boring, Drilling and Milling machine: "This machine is the pride of our shop. We're more than pleased with it. Its services are always in great demand."

"Because the Model 340-T is so versatile, our machinist can perform many complex, precision operations in a single setup . . . apply faster cutting speeds on heavy cuts and hold exact tolerances. One of the many workpieces we produce is this 40" x 50" cast aluminum Gimbal ring. Critical points in machining this casting are alignment of bores and squareness to .001" and bore diameters finished within .0005". What's more, the entire lot of 63 pieces were completed without a single rejection."

This Model 340-T is equipped with an extended saddle with saddle supports and an Automatic Electric Positioning Device. The accessory rotary indexing table is mounted on the machine table. With this combination the operator is able to materially reduce the time ordinarily required to set up and index the work. The Automatic Positioning Device automatically locates and controls the distances between machined holes.

If you, like Stacy Machine Works, Inc. face unusual machining and production problems, call in your G&L representative. He'll be glad to help you solve them.



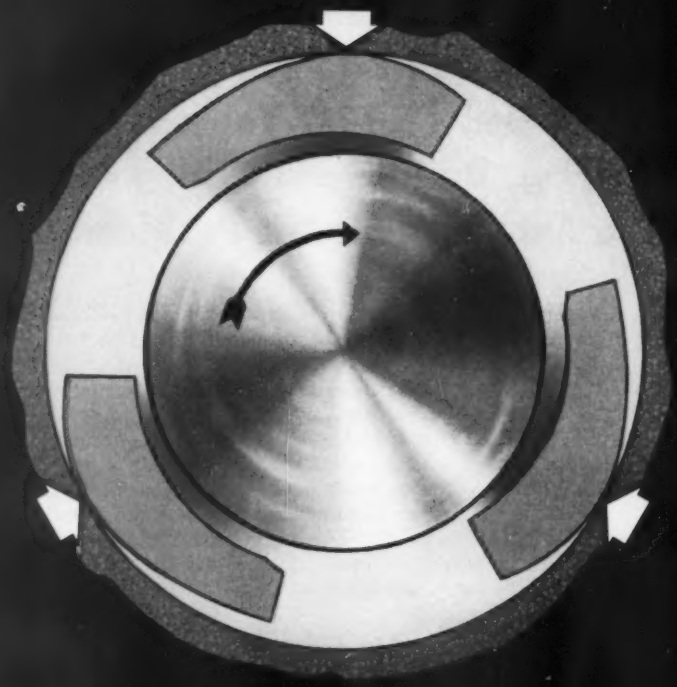
LITERATURE AVAILABLE:
Ask for Catalog No. 30-T with details on 30 Series Precision Horizontal Boring, Drilling and Milling Machines

GIDDINGS & LEWIS MACHINE TOOL CO.

FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools

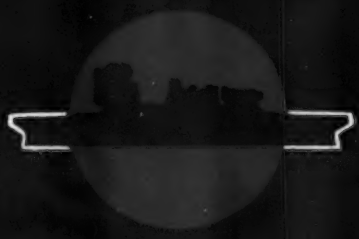
Unequaled Attendance Record



CINCINNATI FILMATIC grinding machines are symbolized here.

PLAIN GRINDING MACHINES

UNIVERSAL GRINDING MACHINES



ROLL GRINDING MACHINES

CINCINNATI

OVER 17 YEARS, WITHOUT MISSING ONE SINGLE MINUTE OF THE WORKING DAY!

That's the amazing record of CINCINNATI FILMATIC grinding wheel spindle bearings, a standard feature of Cincinnati centertype and centerless grinding machines. Some of these machines, built 17 or more years ago, are still running, and the grinding wheel spindle bearings have never once required adjustment or maintenance; have never once slowed down or stopped production.

Over 99% of FILMATIC spindle bearings—thousands of them—have compiled this highly desirable cost-reducing record for Cincinnati grinding machines in metalworking shops everywhere.

You can obtain the advantages of FILMATIC spindle bearings by installing Cincinnati precision grinding machines in your shop. Would you like to know more about these bearings? Write for the booklet illustrated here. And if you're not familiar with current Cincinnati grinding machines, write for general catalog No. M-1776-2, or look in Sweet's Machine Tool Catalog.

Space does not permit going into detail about CINCINNATI FILMATIC spindle bearings. The full story, and how they can benefit your shop, is contained in this profusely illustrated booklet. Write for your copy. Ask for publication No. G-604.

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

CINCINNATI

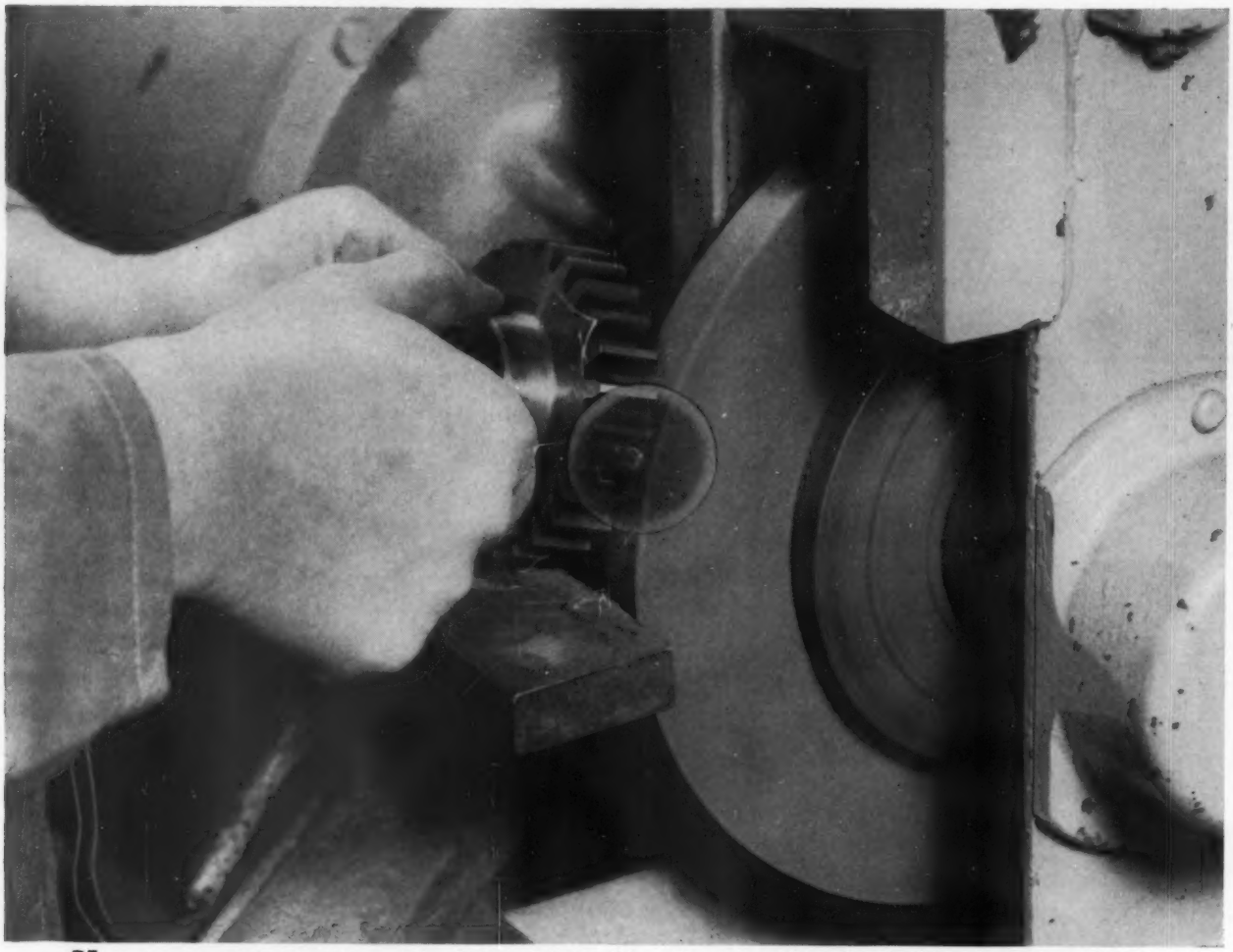
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

CENTERLESS GRINDING MACHINES

CHUCKING GRINDING MACHINES

MICRO-CENTRIC GRINDING MACHINES

CENTERLESS LAPPING MACHINES



BF — A universal favorite for removing light welds, breaking edges on machined work, deburring, taking off flash from plastic parts and many other light portable and bench grinding operations. To be used on periphery only.

The jobs they do!...The money they save!

Norton Reinforced Wheels add the "TOUCH of GOLD" that cuts time and costs on countless everyday grinding jobs

You get *more* than 100 cents' worth of usefulness for every dollar you spend on Norton Reinforced Wheels.

You get extra-long service life, exceptional strength and fast, cool, trouble-free grinding — the Norton-engineered "Touch of Gold" that saves you money in the widest range of routine grinding jobs, from light deburring to heavy cutting-off.

To this top grinding performance Norton Reinforced Wheels add a wide margin of safety. All four are resinoid bonded and reinforced by layers of tough fabric molded into them. As follows:

BF — *Semi-flexible straight wheel, cotton fabric reinforcement. Also available in mounted wheels and points and hand sticks.*

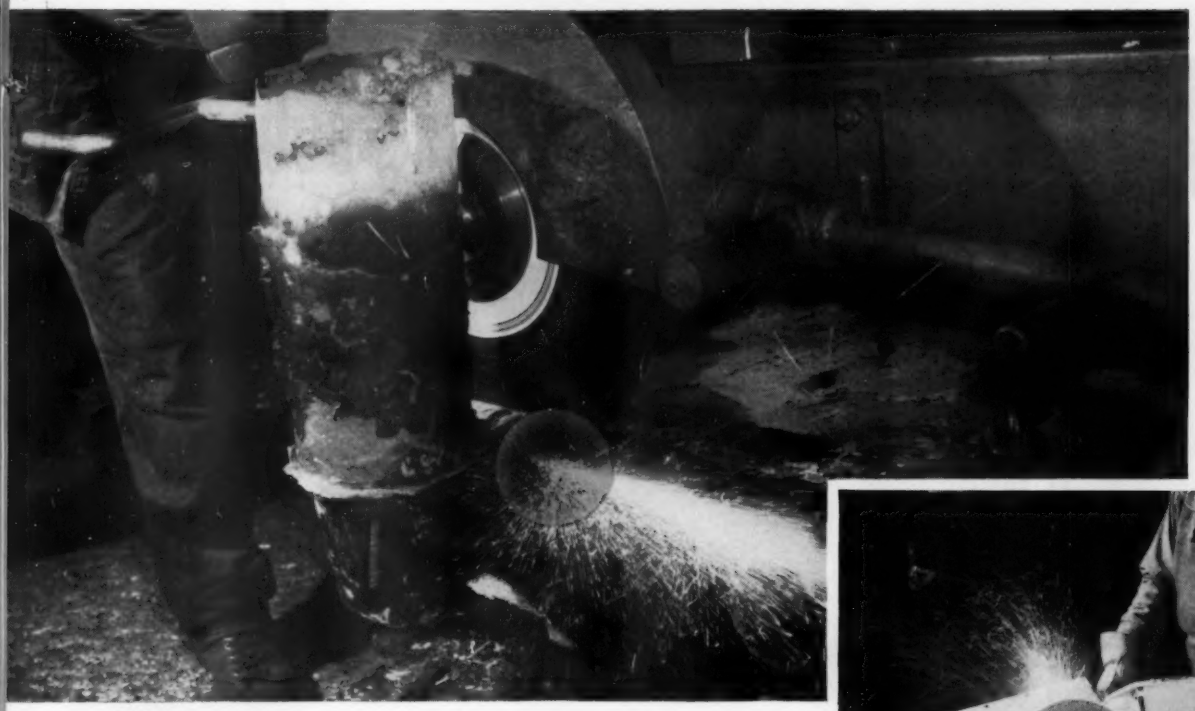
BN — *Straight wheel with glass cloth reinforcement. Primarily a cut-off wheel, its rough knurled sides provide additional cutting action.*

BD — *Rigid hub-type. Glass cloth and Nylon reinforcement. Designed especially for right angle portables and disc sanders.*

BFR — *Semi-flexible hub-type. Cotton fabric and Nylon reinforcement.*

See Your Norton Distributor

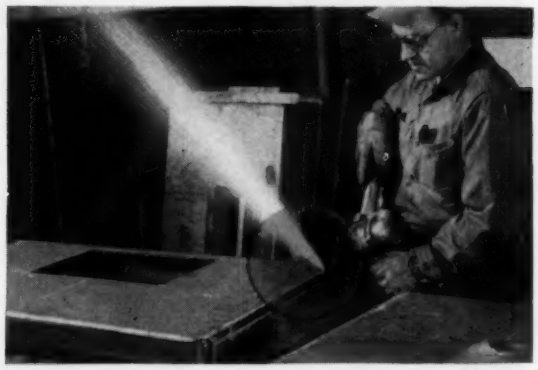
for a demonstration of Norton Reinforced Wheels in your shop, on the jobs you're doing every day. Ask him for the new, 34-page illustrated catalog on Reinforced Wheels. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone book, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Massachusetts.



BN — The preferred cut-off wheel for non-ferrous and non-metallic jobs. Also excellent for cutting wire rope, slotting rails, tuck pointing etc. Used on swing-frame and stationary cutting-off machines, large and small portables.

BD — A specialist in heavier stock removal, such as welds on fabricated work, smoothing flame-cut edges, cleaning between teeth of gear castings, etc. — also for slotting, notching and cutting-off.

BF — **Mounted Wheels and Points** have the same strong laminated construction as the larger BF wheels. For polishing die cavities, chamfering, Brinell spotting, etc. For hand finishing, use BF sticks.



BFR — Excels at the lighter portable jobs, such as rust and scale removal, light weld grinding, scarfing and beveling, blending contours, notching gates and risers.

W-1636

NORTON

Making better products... to make your products better

and its **BEHR-MANNING** *division*

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

Bigger output less tool wear

. . . fewer rejects **lower costs** when you do the job with **MX**

the freer-machining screw stock

THE increased production, the longer tool life, the smoother finish and the greater accuracy you can obtain with USS MX Free-Machining Steel all combine to pay off in *lower costs per part.*

USS MX has so consistently out-performed ordinary screw stock that we can tell you with complete confidence that MX will cut the cost of *any* part you now machine from regular Bessemer grades. (You can prove this for yourself by giving MX a trial on your own machines.)

In the hundreds of cases on which we have reports, cutting speeds with USS MX have been increased as much as 50%. Tools have lasted up to 200% longer. Boosts in output have averaged about 40%, range from 10% to 50%.

That's because USS MX works *with* your tools, not against them. USS MX was designed to ensure maximum cutting speeds compatible with economical tool life, and that's exactly what it does. As a result, production goes up and costs come down wherever you put free-cutting MX to work. What's more, the parts you make are *better* parts.

And here's another reason why USS MX is your best buy today. Despite the fact that it *costs no more* than ordinary screw stock USS MX *has been successfully machined at speeds approaching 350 SFM* — speeds far higher than the *average* (under 250 SFM) used in most shops today.

Furthermore the recent introduction of USS MX *Open-Hearth* Steels now gives you a choice of two superior free-machining grades—Bessemer *and* Open Hearth—so that you can select the screw stock that will give you the *best* properties for any specific application.

USS MX Free-Machining Steel is produced in all the popular screw stock sizes. It is sold in cold finished form by your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest district sales office.

See "THE UNITED STATES STEEL HOUR"—Televised alternate weeks—Consult your newspaper for time and station.

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
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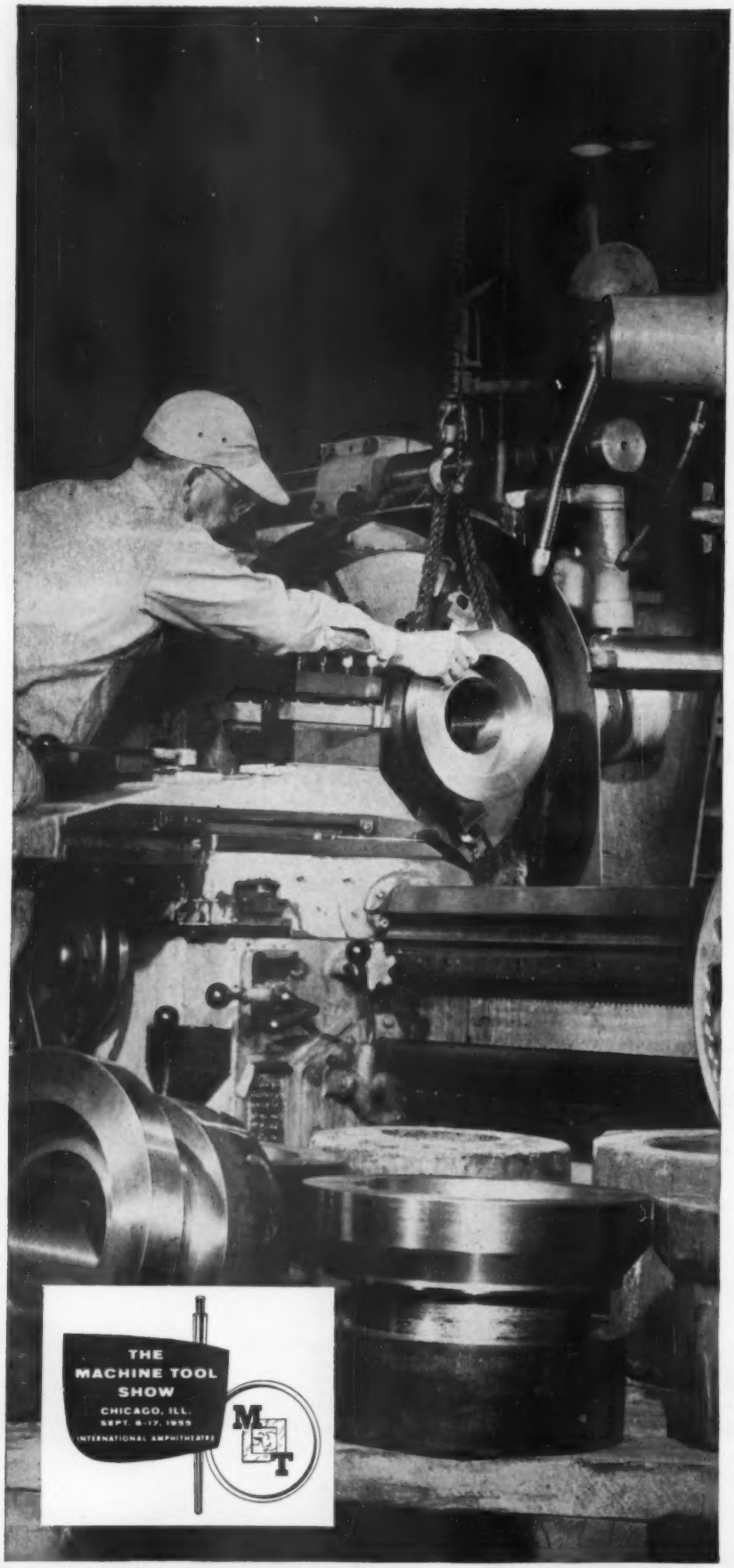
USS

5-207

UNITED STATES STEEL



Machining time cut from 1 hr. 54 min. to 30 minutes!

Here's a good example of what happens when a part is machined on the *right* machine with the proper tooling!

The new machine was a Warner & Swasey 4-A Turret Lathe installed in 1953 at the Emsco Manufacturing Company plant at Houston, Texas. It replaced an 8-year-old saddle type turret lathe.

Slashes Running Time

Previous time for machining a large steel forging was 1 hour 54 minutes. This involved boring a hole to .001" tolerance, facing the end, a two inch turning operation on the 11" O. D., single pointing a 30° angle two inches long, grooving a 1½" wide square groove on the O.D., and breaking the corners.

After the job was transferred to the new Warner & Swasey, and following the setup and tooling recommendations of our Field Engineer, *the operation was completed in 30 minutes!*

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A

another first GREENLEE

More Work Each Shift

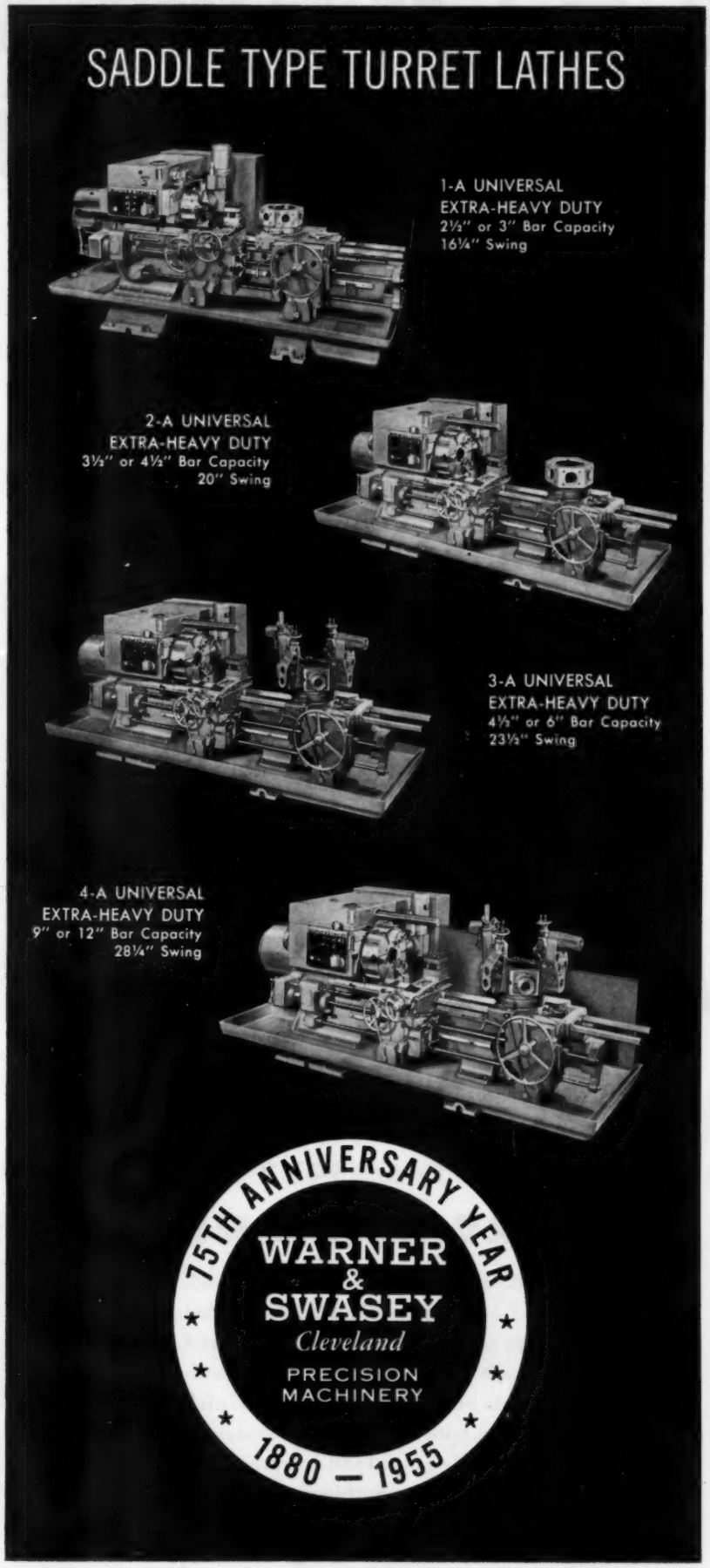
Another operation transferred to this Warner & Swasey was machined in one-fourth the previous time! On a third part the operator produced 13 hours' work in one shift!

Translating these time savings into production, Emsco reports that production of parts transferred to the Warner & Swasey has been increased by 32%. Operators like the machine's ease of handling and its ability to hog off metal while holding extremely close tolerances. And the Warner & Swasey can do this, *without* constant machine adjustment, because of its exclusive self-aligning Vee-ways and gib design.

Job Analysis Pays Off

This is a record of just one machine, but it emphasizes the profit possibilities open to you when the job is done on the *right machine*, properly tooled, and job-analyzed by a turning specialist... a Warner & Swasey Field Engineer.

Whenever you have a turning problem, call in your nearest Warner & Swasey Representative. He'd like the opportunity to work with you. And if replacement is the profitable answer to your problem, he'll help you select the right machine with the proper tooling to handle your work most efficiently.



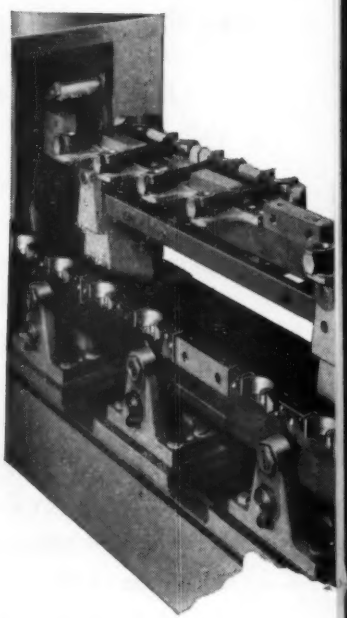
WARNER & SWASEY

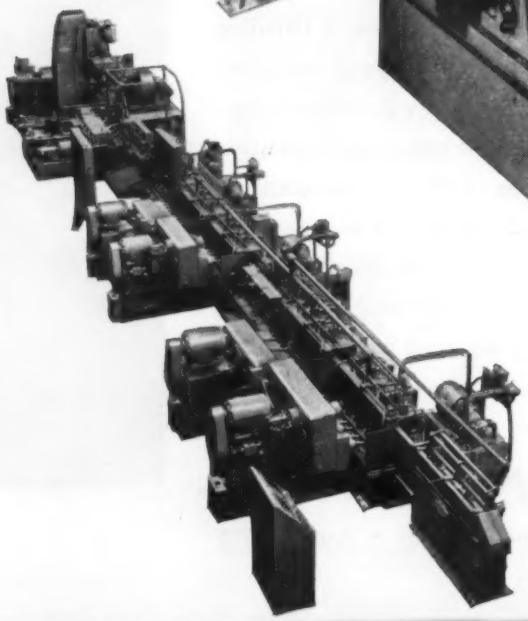
CONNECTING ROD TRANSFER MACHINES

another first . . . GREENLEE

2ND MACHINE

Caps and rods are machined simultaneously. Nests at each station hold work, avoid stresses. Bolt holes are drilled, reamed and inspected, countersunk, counterbored and chamfered. Locating slots and oil grooves are milled, and oil holes are drilled. Rods and caps are discharged to conveyor.





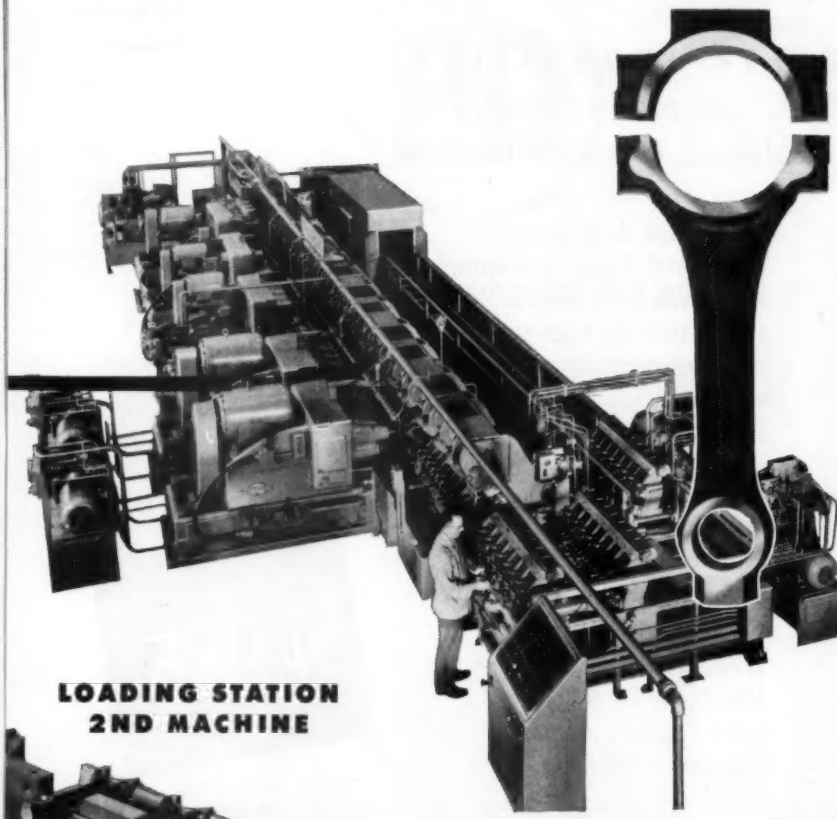
3RD MACHINE

Mating surfaces have been ground, rod and cap assembled. Assembled rods are located and clamped in nests at each station. Crank holes are semi-finish bored, pin holes are finish reamed, both are chamfered. Rod is automatically gauged and accepted or rejected. Wrist pin bushing is assembled, burnished, chamfered at both ends. An oil hole is drilled through bushing, and rod is unloaded onto a conveyor.

CONNECTING-ROD TRANSFER MACHINES!

Greenlee Built Automation into Connecting Rod Production

result: **GREATER ACCURACY, LOWER COST AND INCREASED PRODUCTION**

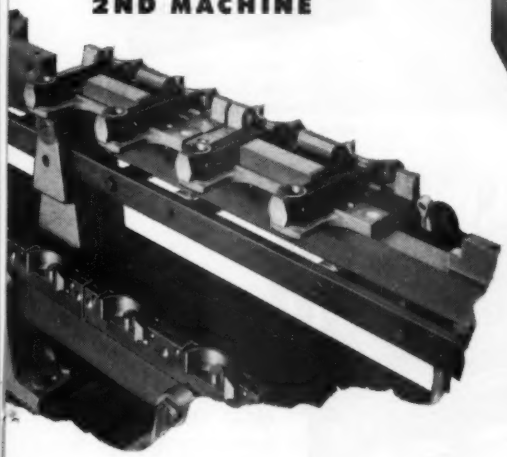


1ST MACHINE

Single-piece rough forgings, with bosses finished, are pallet loaded. Clamping in nests avoids stresses. Crank holes are elliptical bored, pin holes drilled and reamed, caps cut off, caps and rods automatically unloaded onto a conveyor.

Visit our Booth No. 1221

LOADING STATION 2ND MACHINE



investigate

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See how Greenlee can help you avoid production bottlenecks in proposed new facilities . . . overcome existing production problems . . . reduce production costs . . . and help you attain a better, stronger, more competitive position in your industry.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1726 MASON AVENUE
ROCKFORD, ILLINOIS

ALL NEW

Lodge & Shipley

10" Hi-Turn LATHE

PERFECTED FOR PRODUCTION!

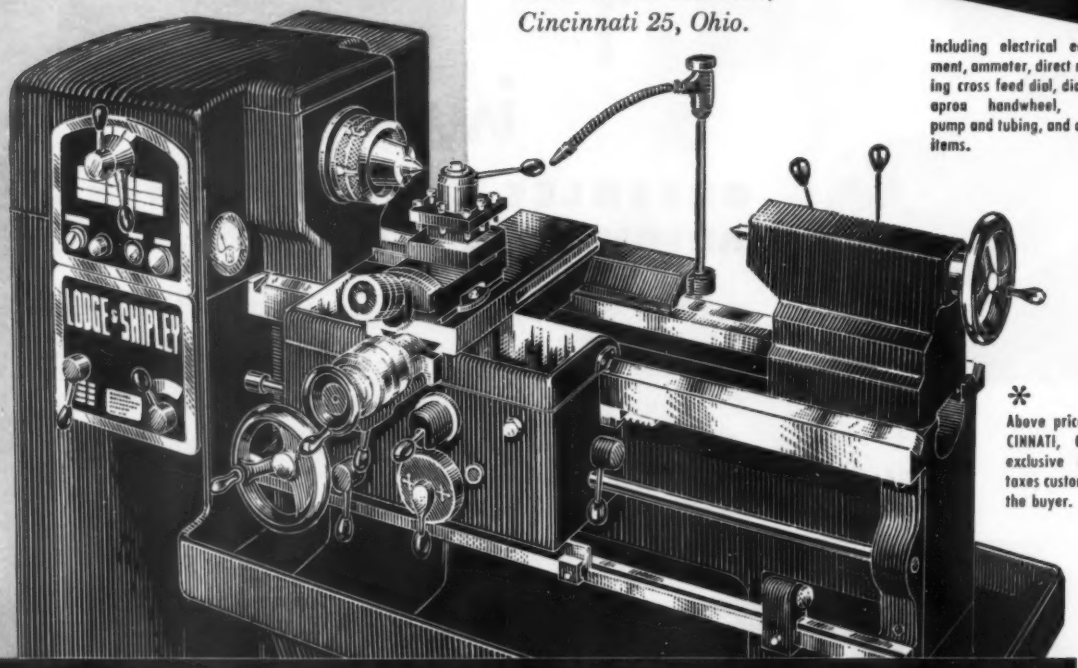
... never before ... so many features ...
so much quality ... at such low cost!

- 9 color-coded speeds up to 3000 RPM and 5 HP
- Totally enclosed quick change gear box
- Dynamically braked motor in leg
- Template-type length stops, magnetic clutch operated
- Flame-hardened replaceable steel bedways
- Hardened and ground cross slide ways
- Direct reading cross feed and top slide dials
- Provision for rear tool block and multiple tools

The Lodge & Shipley 10" HI-TURN Lathe is a completely new concept in lathes. Establishing that lathes for high speed production rarely utilized leadscrews, Lodge & Shipley eliminated the leadscrew and its complicated gearing ... added other features for high production and accuracy at low cost. The result is a rugged lathe of high efficiency at a price substantially lower than conventional lathes.

Write for detailed Bulletin 300, The Lodge & Shipley Co., 3055 Colerain Avenue, Cincinnati 25, Ohio.

only **$4,985*** including electrical equipment, ammeter, direct reading cross feed dial, dial for apron handwheel, pan, pump and tubing, and other items.



* Above price is FOB CINCINNATI, OHIO and is exclusive of applicable taxes customarily paid by the buyer.

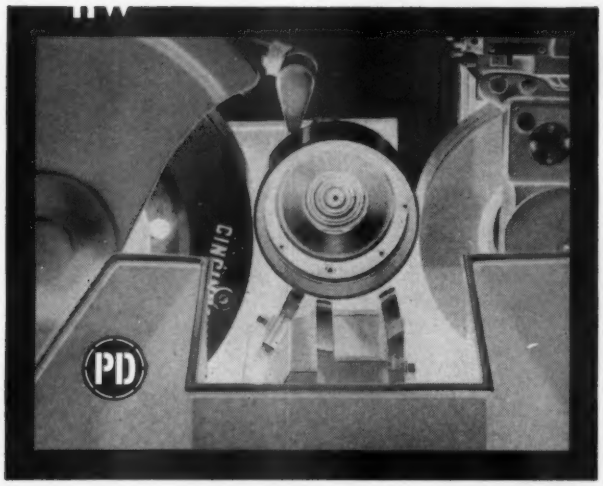
SEE IT NOW! and SEE IT AT THE MACHINE TOOL SHOW, SEPTEMBER 6-17

NOW!

Cincinnati Grinding Wheels offer

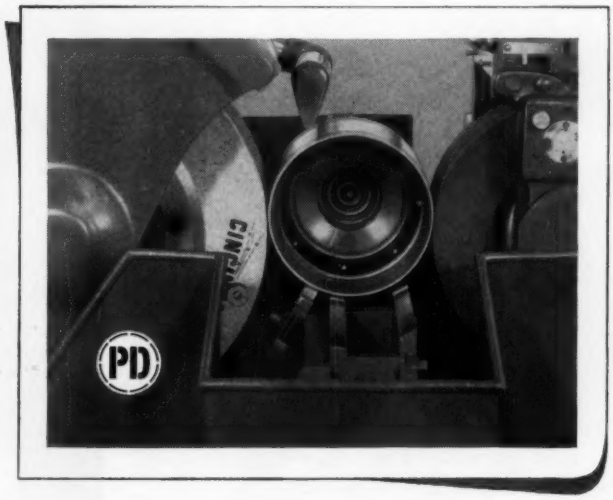
(PD) Positive Duplication

an outstanding development that will save you money and increase production



...POSITIVE DUPLICATION of an original grinding wheel each and every time through the CINCINNATI (PD) Manufacturing Process.

Just as a NEGATIVE guarantees you an exact duplication of a photograph each and every time, you are always assured a...



Positive Duplication is the best news in years for everyone who uses grinding wheels. And small wonder that (PD) is such big news! For here is a truly remarkable achievement in precision manufacturing and quality control that *absolutely can save you money . . . and increase your production.*

Through the CINCINNATI (PD) Manufacturing Process you are assured a Positive Duplication of the original wheel *every* time you reorder. "On grade" with a CINCINNATI (PD) WHEEL means all future (PD) WHEELS will act and grind exactly alike.

Yet CINCINNATI (PD) WHEELS *are priced no higher than ordinary wheels.*

We'll be glad to prove to you how CINCINNATI (PD) WHEELS can save you money and increase your production. Just contact us and we'll send one of our representatives—men who know grinding and grinding machines as well as grinding wheels. Write, wire or telephone Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

CINCINNATI *Grinding Wheels*

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Available

from Winter distributors located in principal cities:

BALANCED Action

TAPS

Hand Taps
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and various types of Taps for Special Applications

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A complete line of Plug and Ring Gages, Threaded and Plain.

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Division of National Twist Drill & Tool Co.

WITH *Dependable* CUTTING EDGES . . .

National milling cutters and hobs, with their dependable cutting edges, are available from Factory and Distributor's stocks. They give you cutting edges for excellent production and long wear.

Milling cutters also available with carbide tips.

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NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

JONES & LAMSON offers you THIS COMBINATION

GREATER SAVINGS

FINEST MACHINES

EASIEST PROCUREMENT

Modern machine tools that produce greater work accuracy at lower costs than ever before.
Scientific research in machining methods, metallurgy, tool geometry and inspection procedures.
Realistic Procurement — you have your choice of several sound financing methods, plus the advantages of new tax laws with more equitable write-offs.

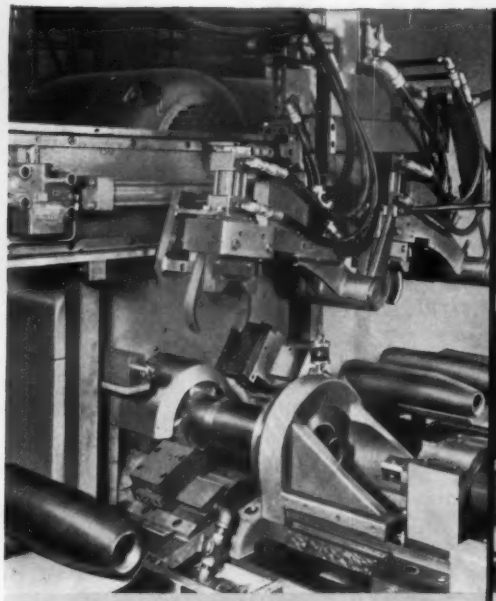
From initial survey of your production requirements right through to delivery and installation of new equipment, every phase of J&L's Replacement Program service is complete, competent and reliable.

The man who needs a machine tool . . . is already paying for it.

JONES & LAMSON MACHINE COMPANY

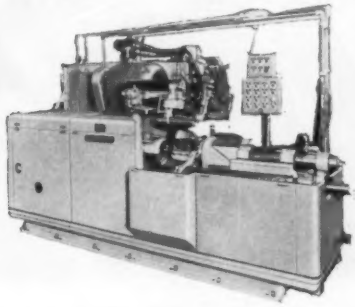
502 Clinton St., Dept. 710, Springfield, Vt., U. S. A.

UNIVERSAL TURRET LATHES • FAY AUTOMATIC LATHES
AUTOMATIC DOUBLE-END MILLING & CENTERING MACHINES • AUTOMATIC THREAD & FORM GRINDERS
OPTICAL COMPARATORS • AUTOMATIC OPENING THREADING DIES & CHASERS



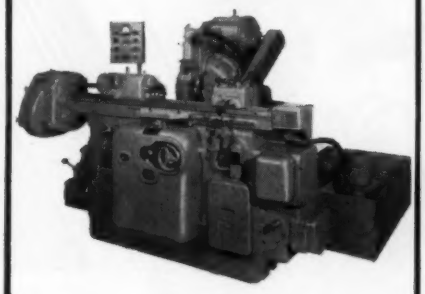
AUTOMATIC HANDLING

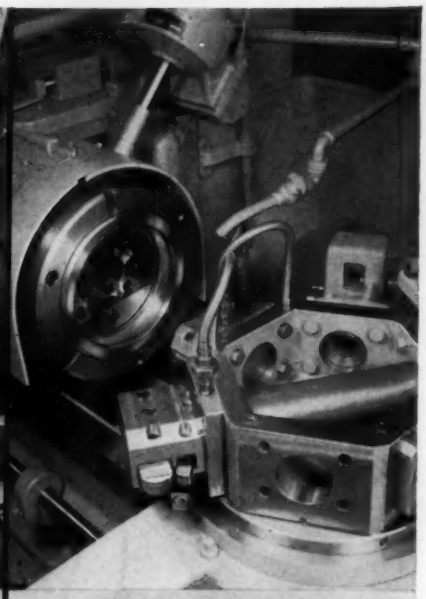
Completely automatic operation of this Fay Automatic lathe, including *loading, machining, chip and coolant disposal* and *unloading*, ups production to 180 pcs. per hour at 100% efficiency in the machining of these shells.



NEW METHODS

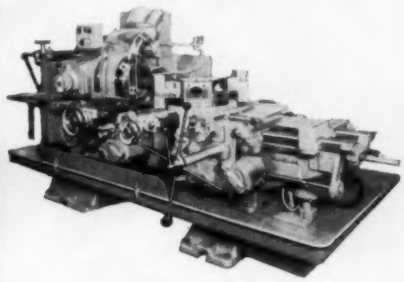
By grinding this worm (stock removal .1235″ — one pass) on a J&L 6 x 36″ Automatic Thread Grinder, production is increased 160% per machine over previous methods.





VERSATILE TOOLING

High production methods of tooling for automatic lathes were simplified and applied to three 7B J&L Universal Turret Lathes. Inner and outer Ball Bearing Races are produced on the same machines. Set up time from one lot to the next does not exceed fifteen to twenty minutes per machine.



Jones & Lamson's unique Procurement Plan offers you a choice of methods for procuring new, high-efficiency equipment. You may buy outright; pay-from-productivity on a variety of bases, at interest rates of 3¼% and lower (add-on); or you may use any of several variations of a truly flexible lease plan.

MACHINE TOOL DIVISION

Valuable information is yours for the asking. Simply fill in the coupon below, *clip it to your letterhead*, and mail.

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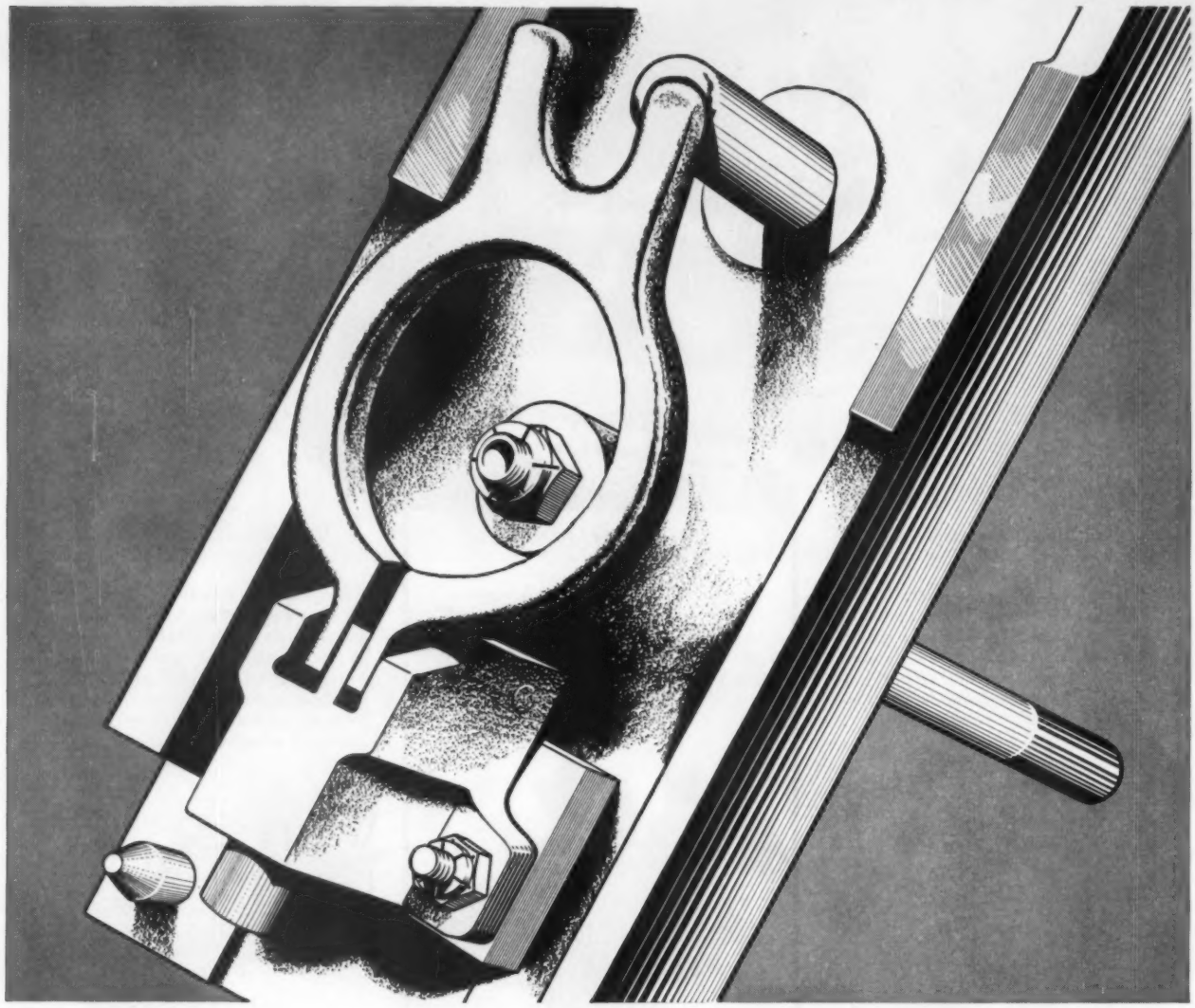
Please send me the Jones & Lamson *Machine Tool Replacement Information Kit.*

Name.....

Title.....

Production Pointers

FLEXLOC AT WORK



MORE AND MORE FLEXLOC LOCKNUTS are being used on assemblies where dependable locking is essential to the operating efficiency of the equipment. This stationary spindle is a good example of the difficult jobs FLEXLOC locknuts are doing throughout industry.

FLEXLOCS were put on this unit after a number of other locknuts had failed to keep the spindles tight. Even the high humidity, extreme vibration, and presence of lint and grease have not loosened the FLEXLOCS.

FLEXLOC Self-Locking Nuts—one piece, all metal—are available in a full range of sizes in any quantity. Standard FLEXLOCS are stocked by leading industrial distributors everywhere. Write for Bulletin 866 and samples. STANDARD PRESSED STEEL CO., Jenkintown 1, Pa.

DO YOU KNOW? Standard FLEXLOCS smooth off rough bolt threads. The locking threads on all-metal FLEXLOCS are not chewed up when used on rough bolts.

Standard FLEXLOCS lock securely on bolts varying in diameter tolerances. The all-metal, resilient locking sections of the nut accommodate themselves to the diameter tolerances.

Standard FLEXLOCS are one piece, all metal. They are not affected by temperatures to 550°F. Nuts lacking these features have a more restricted temperature range.

Standard FLEXLOCS lock securely—stopped or seated—when 1½ threads of a standard bolt are past the top of the nut.

Standard FLEXLOCS are not affected by moisture, oil, dirt or grit. They lock efficiently under all conditions, regardless of the vibration encountered.

FLEXLOC®
LOCKNUT DIVISION
SPS
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YESTERDAY'S MACHINE TOOLS

Production Pointers from GISHOLT

TIME-SAVING IDEAS

Presented as a service to production men, we hope some of these interesting ideas, chosen from thousands of jobs, will suggest ways to help cut time and costs in your own work.

MASSIVE FLYWHEELS COMPLETED IN ONE AUTOMATIC OPERATION

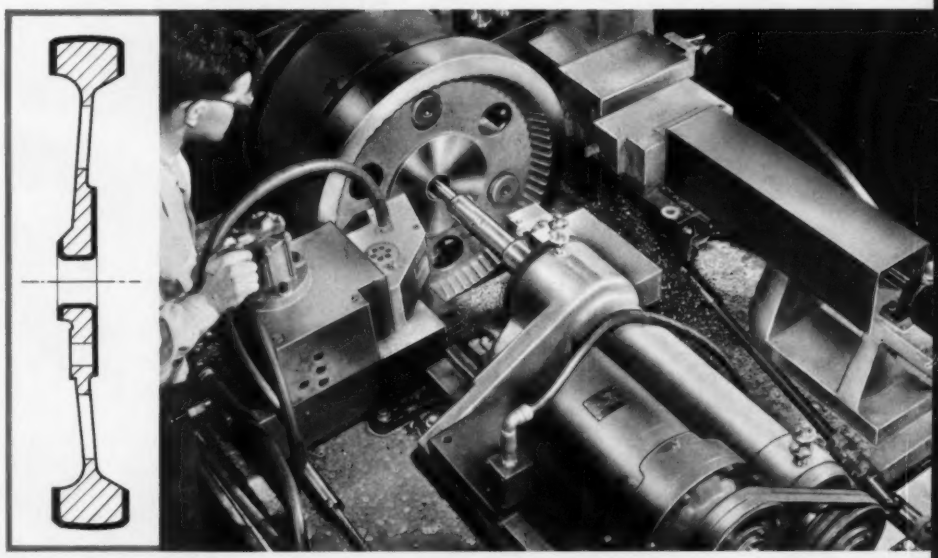
Simplimatic Automatic Lathe and Balancer Team Up to Drive Down Costs

All machining on this 320-lb. cast-iron hay baler flywheel is completed in one chucking on this Gisholt Simplimatic Automatic Lathe. The part is chucked in three cored holes in the web. V-grooves in the chuck jaws centralize the work and give a true-running web. Spring-loaded jacks provide support and eliminate vibration.

Four front slide tools straddle face the rim, face the center pad and chamfer the back edge. A cam-guided tool on the rear slide turns the OD crown and another tool chamfers the outer edge of the rim. Both slides have automatic tool relief. Two tools on a piloted speeder boring bar mounted on the center slide finish the bore and a third tool chamfers. A back boring attachment, operating through the spindle, completes the job by shave facing the back pad and chamfering the bore. Eleven tools machine ten surfaces in seven minutes f.t.f.

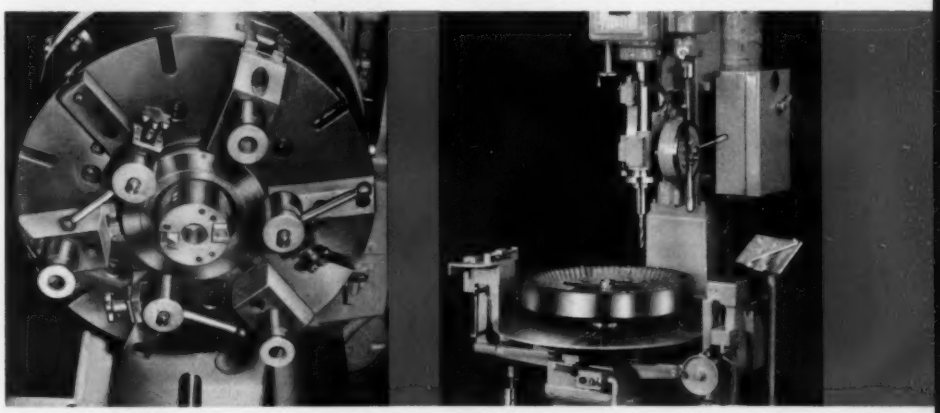
While a new workpiece is being machined, the operator places the completed part in a Gisholt 14E Static Balancer. This is arranged with correction equipment so that unbalance can be measured, located, corrected and inspected in one handling.

From rough casting to machined and balanced flywheel—all done by one operator and the two Gisholt machines.



Heavy lines show ten surfaces machined in one chucking.

Close-up of workpiece and tooling. Note speeder boring bar arrangement to give required cutting speed in small bore diameter.



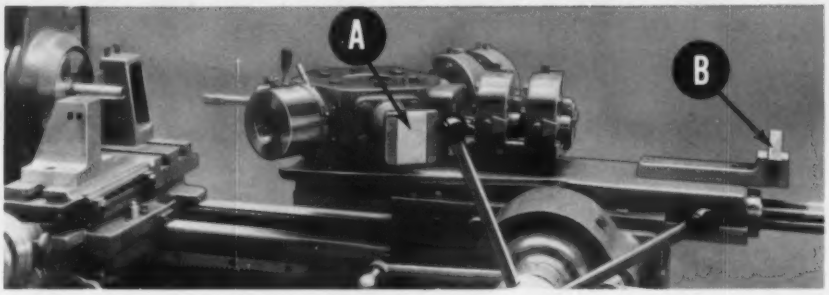
V-grooved chuck jaws and spring-loaded jacks. Back boring attachment tools feed out through the spindle to face back pad and chamfer bore.

Gisholt 14E Static Balancer with integral correction equipment. Up to 600 ounce-inches of unbalance can be quickly measured.

TIME-SAVING IDEAS

HOW TO DO LONG SHAFTS ON SHORT LATHE

Ram Type Machine Shows How Good Idea Can Save on Equipment Costs



The long and short of this pointer is worth remembering the next time you have a problem like it.

Here, a Gisholt No. 4 Ram Type Turret Lathe, which has 25¾ inches from hexagon turret face to spindle, is handling a 46⅜-inch-long shaft. The seamless steel tubing is fed through the spindle and locates against stock stop "A" for simple turning, reaming, necking and threading operations. Then the hexagon turret is indexed so that stop "A" again faces the work. The stop is hinged and flips up, permitting the bar stock to pass completely through the turret and locate against stop "B." The body of stop "A" acts as a steady-rest to prevent whip while the shaft is cut off to length from the rear tool post on the cross slide. Stop "B" then also swings out of the way for easy removal of the finished shaft. The whole job takes only 2.75 minutes floor-to-floor.

By simply allowing the workpiece to pass through the hexagon turret, a shaft nearly twice the length of the machine's capacity can be handled—sparing the need for a larger, more costly lathe.

TURRET-MOUNTED LOADER SPEEDS CHUCKING

Gisholt Fastermatic Automatic Turret Lathe uses Loading Arbor to Save Time and Effort.

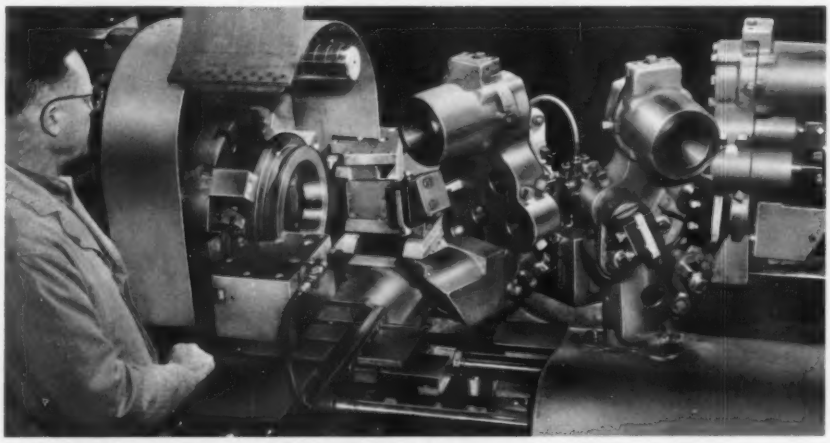
Even if you have your machining time down pat, you may still be able to cut over-all time further with a better loading method.

Here, to simplify and speed up chucking operations, this 2F Fastermatic has a special turret-mounted loader arrangement. As each machine cycle ends, the finished part is removed. Then forward movement of the hexagon turret carriage brings a rough workpiece on the loading arbor to the chuck. Spring-loaded studs on the arbor force the piece against the chuck jacks to locate the work.

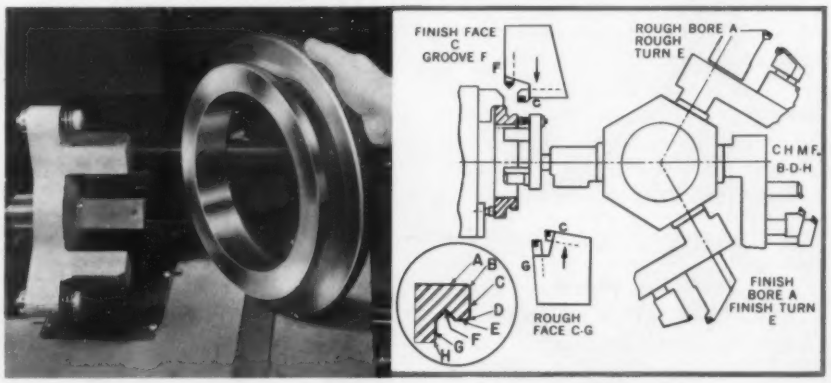
With simplified loading and chucking and a fully automatic machine cycle, time is just 6.9 minutes f.t.f.

The hexagon turret stations are tooled to turn, bore and chamfer with all facing and grooving operations on the steel rings performed from the front and rear cross slides.

Using a loading arbor on one turret face of the Fastermatic Automatic Turret Lathe reduces manual effort and simplifies chucking.



Tooling setup for first operation machining on steel rings.



Here's the special turret-mounted loader. Also a finished part showing surfaces machined.

GISHOLT

TIME-SAVING IDEAS

AUTOMATIC LATHE DOUBLES AT SUPERFINISHING AND BEARINGIZING

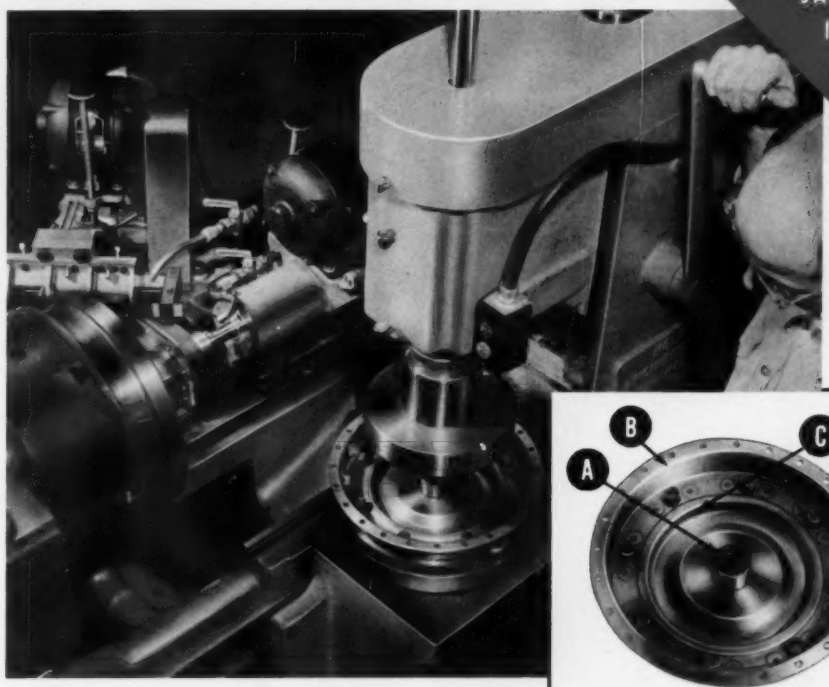
Gisholt No. 12 Hydraulic Lathe Adapts for Special Work

For many of those special jobs that come along present equipment can lend a hand. This unique application of a Gisholt No. 12 Hydraulic Lathe, where three jobs are performed in one handling, is a good case in point.

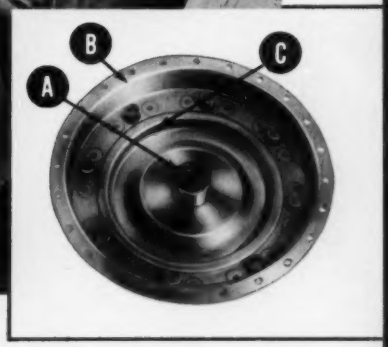
Here, it is specially tooled to finish automotive transmission converter clutch housing and bushing assemblies. Two No. 1 Superfinishing attachments are mounted on the rear independent slide. One Superfinishes the flat hub face (A) of clutch housing for thrust washer contact. At the same time the 45-degree sealing face (B) is also Superfinished.

While this part is being Superfinished, the preceding workpiece has its 8-inch bore (C) sized and finished by a vertical Bearingizer unit, also mounted on the No. 12 Hydraulic Lathe.

Production is fast—over 50 parts per hour. Tolerances are closely held and the required "controlled" surface finish readings easily obtained.



By simple adaptation, this No. 12 Hydraulic Automatic Lathe performs as a special machine to produce Superfinished and Bearingized parts.



To show tooling, Superfinishing quills are withdrawn, Bearingizer unit is raised. While part is Superfinished, another is Bearingized.

THREAD-GRINDING WHEELS BALANCED FOR MORE PRECISE WORK

Gisholt DYNETRIC Balancer Measures, Locates Unbalance to Eliminate Harmful Vibration

Thread-grinding wheels operate at high speeds and therefore must be very accurately balanced to eliminate vibration which would hamper grinding to close tolerances. For this type of workpiece, where the length along the axis is small compared to the diameter, correction is usually made only for force (static) unbalance.

For fast, simple, low-cost balancing this Gisholt Type 3S DYNETRIC Balancing Machine is used. It is easily set up to measure and locate force unbalance. The strobe lamp flashes on the numbered band and indicates which of the tapped holes provided in the mounting flange plate will receive the correction weight. At the same time, the amount meter tells the operator exactly which weight screw is to be added to bring the part into precise balance.

By eliminating vibration, grinding wheels rotate very smoothly and produce better threads to closer tolerances.

Balancing, performed on new wheels and after dressing old wheels, assures accuracy and improves performance.

DYNETRIC BALANCERS GISHOLT

Complete courses covering all phases of precision balancing are offered by the *Gisholt Balancing School*. Get details and starting dates.

For A Clear Picture . . .

of the various plans under which you can acquire new machine tools, you'll find this a very helpful booklet. It explains and illustrates time-buying and leasing methods to show how you can benefit from these methods. Write for Booklet P-1173.

GISHOLT

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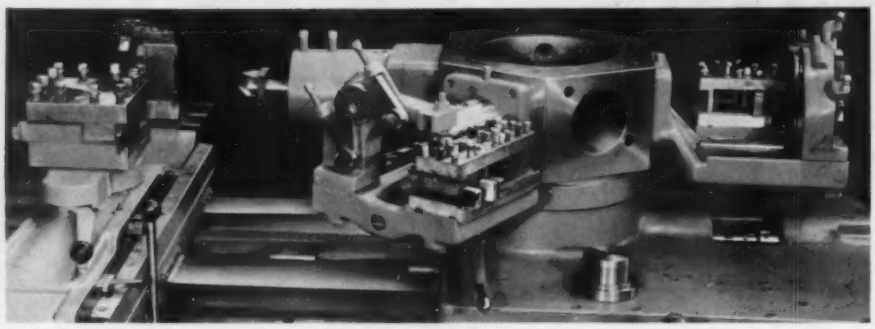
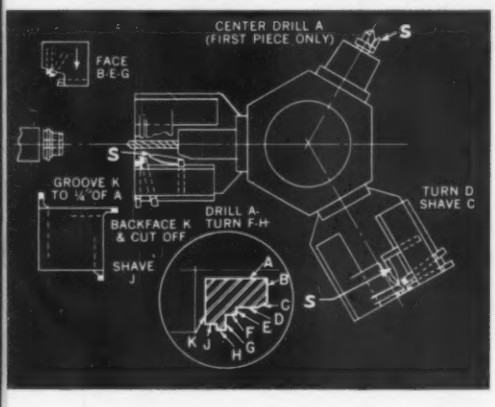
TIME-SAVING IDEAS

MULTIPLE TOOLING ANSWERS SMALL LOT PRODUCTION

This tooling arrangement makes an ideal setup for the various machining operations shown in the layout. As few as five pieces per lot are handled economically this way.



Saddle Type Lathe Produces Coupling Hubs Faster, More Accurately



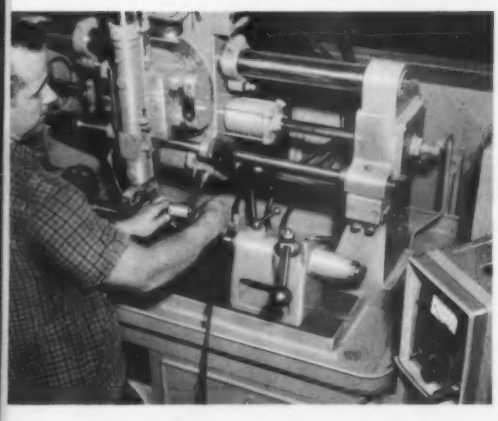
Here a standard Gisholt 3L Saddle Type Turret Lathe is multiple tooled with lots as few as five pieces handled economically. The lathe is equipped with a bridge-type cross slide and is tooled to machine steel flexible coupling hubs from bar stock.

All tooling for the several different sized parts is pre-set. This includes the group of tools on the rear of the cross slide and also the special tool blocks held in the multiple cutter turners on the hexagon turret. To go from one part size to another, the operator merely changes these special tool blocks and adjusts the multiple cutter turner rollers. Special stops "S" on turret tooling determine the length of all turned diameters and shoulder positions directly from the end of the piece. These stops eliminate the time required to set turret stops. Also, a stock stop to position the work prior to starting machining operations is not required.

With this kind of interchangeable pre-set tooling on Saddle Type Turret Lathe, you have a high-production setup which can be used for small lots.

HOW SPOT CHECKING SAVES TIME ON SUPERFINISHING JOBS

Inspection Equipment on Machine Speeds Small Lot Operations



Operator is checking surface finish reading with inspection equipment mounted on Gisholt 51A Superfinisher.

Superfinishing, as you may know, is the process whereby a "controlled" surface finish can be quickly and economically obtained, piece after piece —whether the specified final finish is 50, 30, 10 or 1 micro-inch RMS.

In small job shop operations, various parts are handled and finish requirements vary considerably. This necessitates some means by which the operator can determine when he has produced the specified surface finish on a part.

This standard Gisholt 51A Superfinishing Machine is equipped with a Profilometer Unit. This provides a means of instant checking the surface roughness of the part being Superfinished at any time during the Superfinishing operation. The part doesn't have to be removed. It's possible to Superfinish each individual part to the blueprint tolerance before leaving the machine.

Superfinishing is made even more efficient and lower cost with this means of keeping a "running" check on surface roughness. It's ideal for handling small lots and where different surface finishes are specified.

Write for book, "Wear and Surface Finish" which gives full information on Superfinish.

No. 5-655
639

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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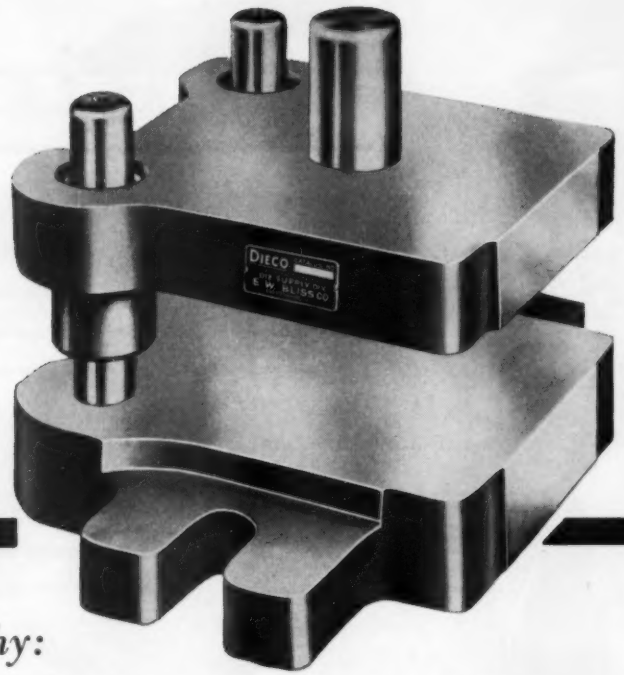

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This new line of Westinghouse high-voltage fused starters offers industry more protection—more operating simplicity than any other. Here are a few reasons why:

Extension of the BAL fuse line up to 400 amperes with the first and only 400-ampere, double-barreled, single-unit fuse; a new 50,000-kva air break contactor featuring the most advanced arc interrupting action yet developed; and new enclosures providing new levels of convenience and safety.

Booklet B-6535 has more facts on this outstanding new starter. Get it from your Westinghouse engineer —or write Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pa.

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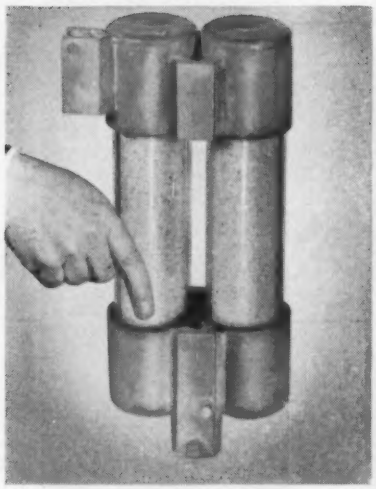
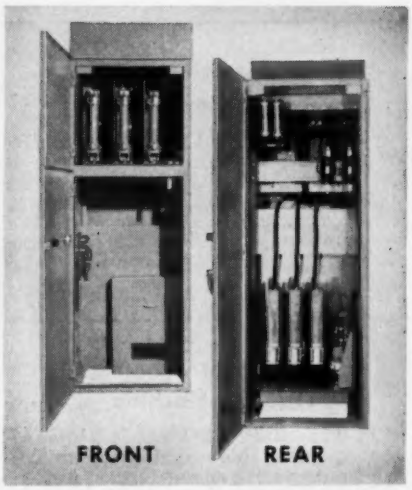
YOU CAN BE SURE... IF IT'S Westinghouse



New 400-ampere, double-barreled, type BAL fuse features "no-bolt" brazed connections which insure equal division of current. Complete coordination of fuses is assured. Exclusive BAL single-barreled design for fuses up to 200 amperes is retained.

New air break contactor (200 and 400-ampere sizes) features a unique arc chute design which greatly simplifies inspection and maintenance of the contacts. Simply pull the arc chute down —contacts are immediately and conveniently accessible.



New enclosure design provides both mechanical and electrical interlocks; front and rear access DOORS; top-mounted bus arrangements; separate compartmentation of high and low-voltage components—all designed for maximum safety of personnel.

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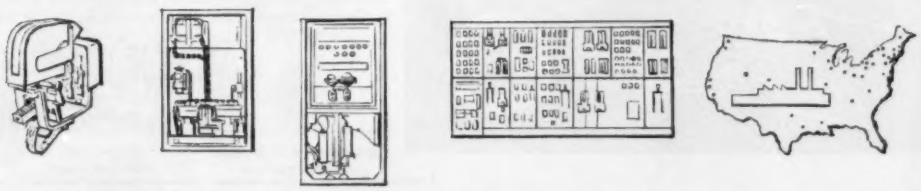

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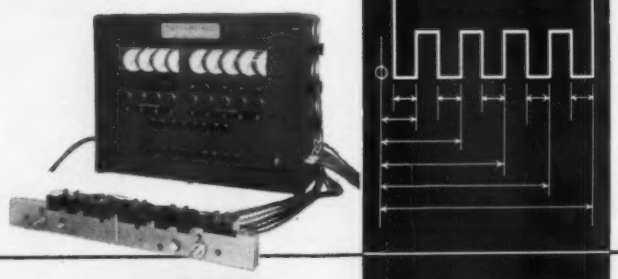
NUMBER FOUR IN A SERIES

Air Gaging for Automation

Some Taft-Peirce CompAIRator Air Gage Installations for mass production quality control...

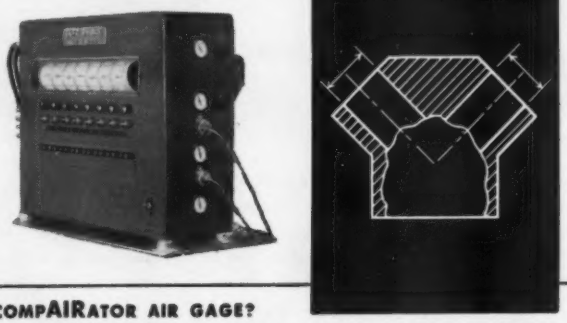
Size Control on Automatic Lathe

This T-P Air-Electric CompAIRator is attached to an automatic lathe. As parts approach tolerance limits, gaging unit sends an electrical impulse to machine, which advances or retracts cutting tool to keep parts in optimum size range. If a part is produced outside the tolerance limits, unit shuts down the machine.



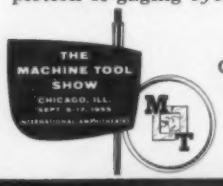
Size Control at Milling Machine

This T-P Air-Electric CompAIRator checks locations and widths of the main bearings of automotive cylinder blocks. 9 dials and lights indicate 5 bearing locations and 4 widths simultaneously. When any location or width is out of tolerance, unit automatically stops milling machine. Light indicates off-size dimension, dial reports exact size.



Size Control in Transfer Machine

This T-P Air-Electric CompAIRator checks 8 cylinder bore diameters simultaneously in V-8 automotive engine blocks. Automatically gages the diameter of the entire length of each bore. If any bore is out of tolerance, a light points it out, and production line is automatically shut down at completion of gaging cycle. Tolerance: .002".



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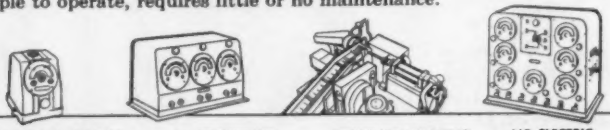
A CompAIRator is a sensitive gaging instrument that measures variations in the velocity of tiny jets of air. When work is placed over these jets, air flow is restricted and its velocity reduced. Any change in air velocity reflects a change in part size, which is immediately shown on a calibrated indicator. Since only air contacts the part in most cases, there is minimum wear on gaging members. Fast, accurate, dependable, a T-P CompAIRator is simple to operate, requires little or no maintenance.



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BUTTERFIELD DIVISION, Derby Line, Vermont and Rock Island, Quebec

wanted:

uninterrupted stamping production

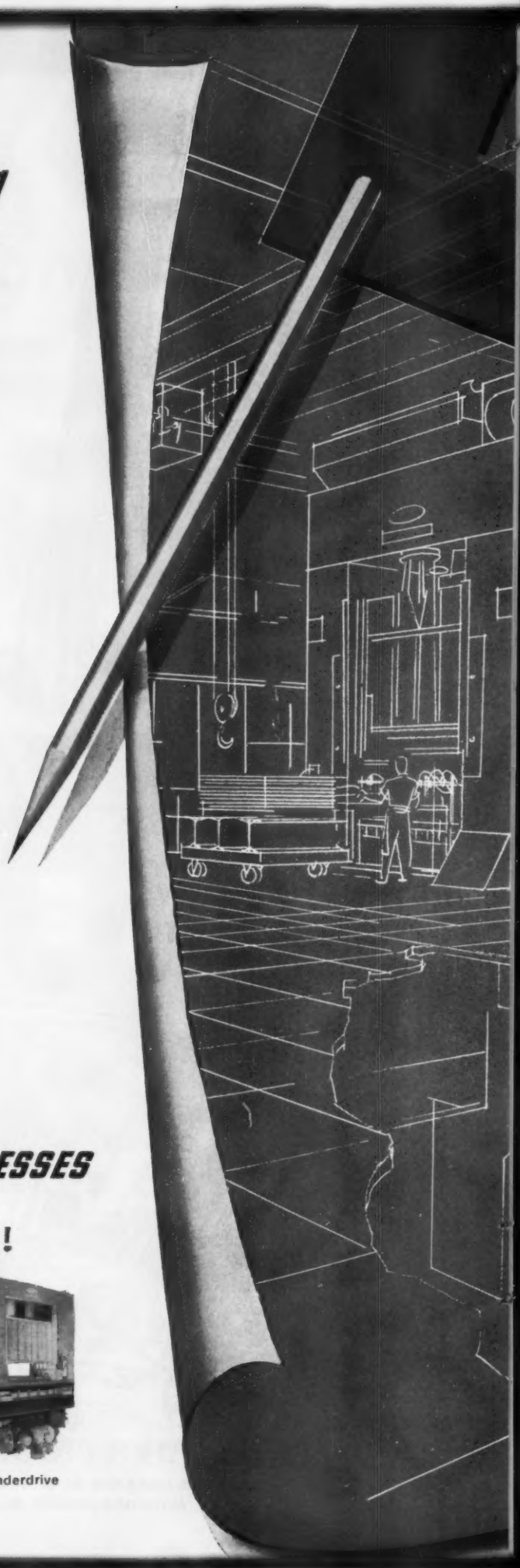
More finished stampings per shift at lower cost is the final test of a new press line . . . to meet this test, production men concentrate on fast, *uninterrupted* production from one end of the line to the other. Every press is a vital station, every operation is critical in keeping the line running as a mass production unit.

That's why you find more and more new stamping lines made up completely of Danly Presses. You will find many reasons. Danly Presses are known for their extra rugged construction to withstand the stresses of continuous operation at full capacity; exclusive control arrangements facilitate automation; maintenance needs are decreased by automatic *oil* lubrication.

There's a great deal more to the Danly Press story, too — design and construction features that will make Danly Presses a must on your new line. Call a Danly engineer for a detailed discussion now.

DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

DANLY

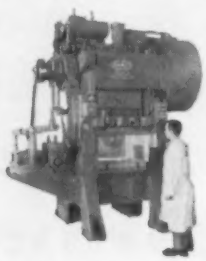


specify:

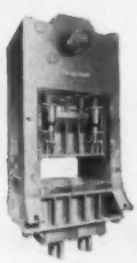
complete lines of NEW DANLY PRESSES

It costs less to run a DANLY PRESS line!

Single Action Straight Side

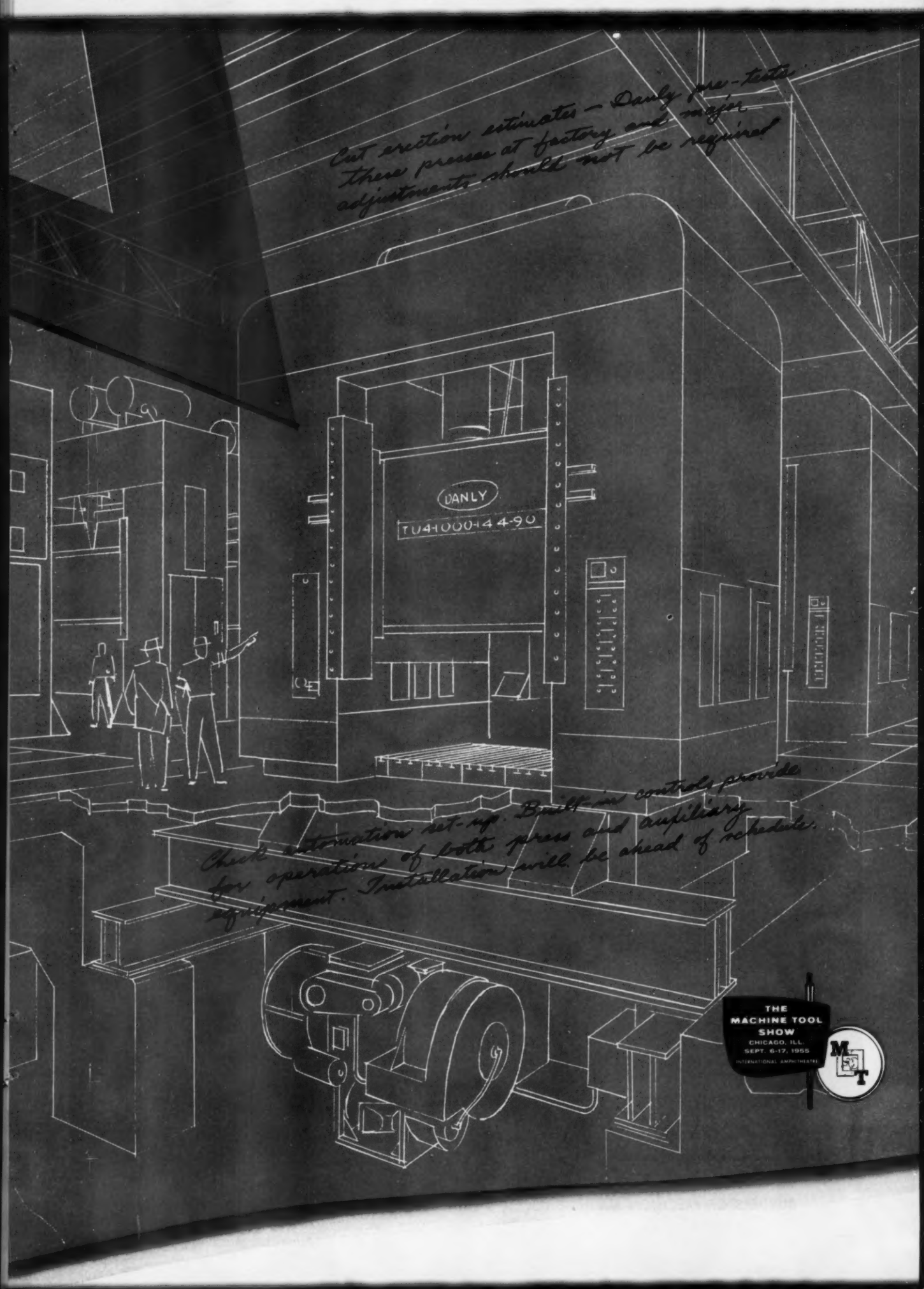


Autofeed



Double Action Straight Side

Underdrive


Cut erection estimates – Danly pre-tests these presses at factory and major adjustments should not be required
DANLY
TU4100-44-90
Check automation set-up. Built-in controls provide for operation of both press and auxiliary equipment. Installation will be ahead of schedule.
THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

PORTAGE

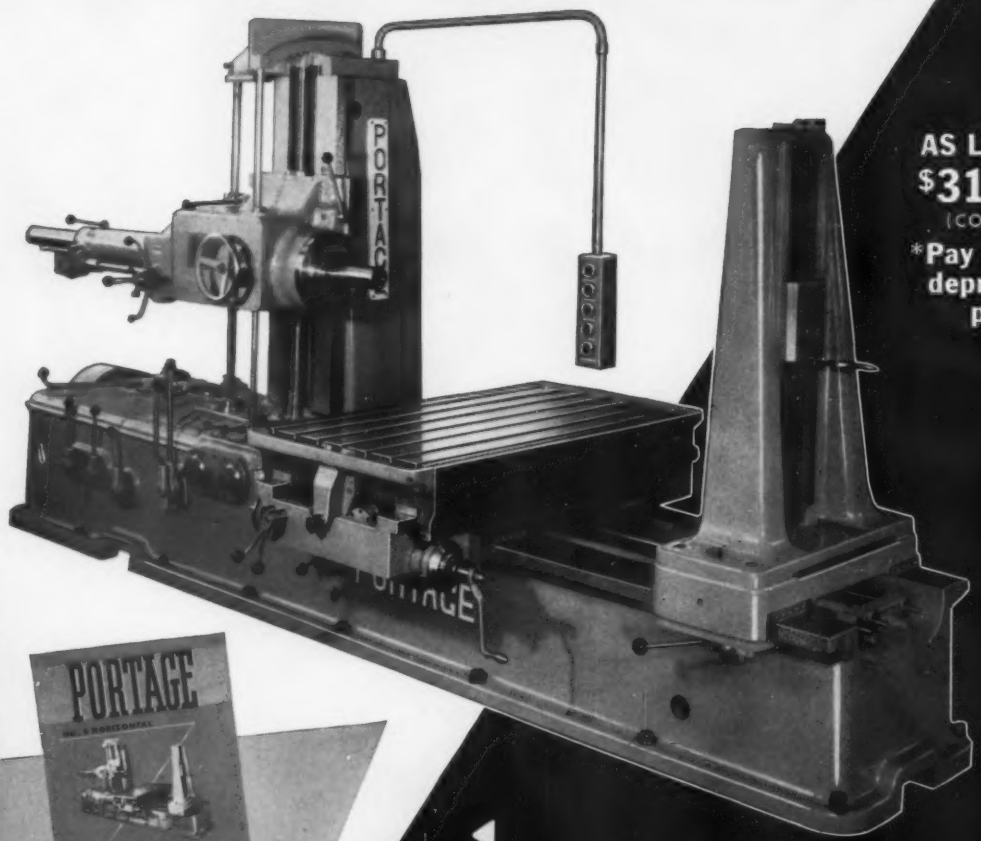
(4" Diameter Spindle)

Horizontal Boring, Drilling & Milling Machine

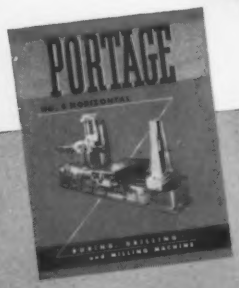
Outstanding . . .

MACHINE OF THE YEAR

Unsurpassed in Price and Quality



AS LOW AS
$31,358
(COMPLETE)
***Pay as you depreciate plan**



Write for Catalog today!

The PORTAGE Boring, Drilling & Milling Machine offers a *real* saving in new machine investment. PORTAGE mills cost from 5% to 20% *LESS* than present comparable makes . . . and the amazing part of this savings is the machine itself . . . Write today for literature covering all the specifications and features on the PORTAGE Mill.

*** For full particulars, phone the factory today!**

THE PORTAGE MACHINE CO.

1026 Sweitzer Avenue • Akron 11, Ohio

Representatives in Principal Cities

BUILDERS OF PRECISION MACHINE TOOLS, SPECIAL AND PRODUCTION MACHINERY SINCE 1916

The Brown Boggs Foundry & Machine Company, Ltd., of Hamilton, Canada, who manufactures this 200-ton Press, thoroughly checked all types of v-belt. They wanted a v-belt that would give efficient, vibrationless, full power delivery. They wanted a v-belt that could be installed quickly and easily. Only Veelos met *both* requirements. And here's what Brown Boggs says about their selection of Veelos . . .

"...for best operating condition ...for the user's convenience"*

Brown Boggs picked Veelos v-belt

*"*We feel that our own factory assembly has put this Press in the best operating condition. To eliminate the necessity for dismantling any part of the equipment, and for the user's convenience in changing belts, we have equipped the drive with Veelos V-Belting.*"

Brown Boggs selected Veelos even though it cost more than ordinary v-belt. They know, however, that "what's best for their customer, is best for their business!" It will pay you to equip your machines with Veelos v-belt. Once you've done that you'll be an enthusiastic Veelos user, too.

Veelos is known as Veelink in Canada and foreign countries.

VEELOS
THE LINK
V-BELT

Get the full story on Veelos... write today for your free copy of the VEELOS DATA BOOK.

MANHEIM MANUFACTURING & BELTING COMPANY
601 Manbel Street, Manheim, Penna.

ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

2088

HARDINGE-SJOGREN

HARDINGE
ELMIRA, N.Y.

SPEED

Collet Chucks with HARDINGE STEEL COLLETS

Available in Five Sizes:
1", 1⅜", 1¾", 2¼", and 3½" collet capacity.

for Accuracy and Durability at Low Cost

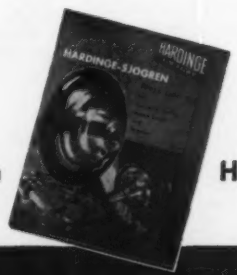
When you order Hardinge-Sjogren Chucks and Hardinge Steel Collets you get all these advantages:

1. Complete Capacity for Hexagon and Square as well as Round.
2. Lowest Initial Cost.
3. Longest Service Life.
4. Grips both short and long lengths properly.

. . . . . and HARDINGE tempered steel collets assure you of quick release, sustained accuracy and durability.

OFFICES IN PRINCIPAL CITIES
Export Office:
269 Lafayette St.,
New York 12, N. Y.

Write for Bulletin 8— complete information on



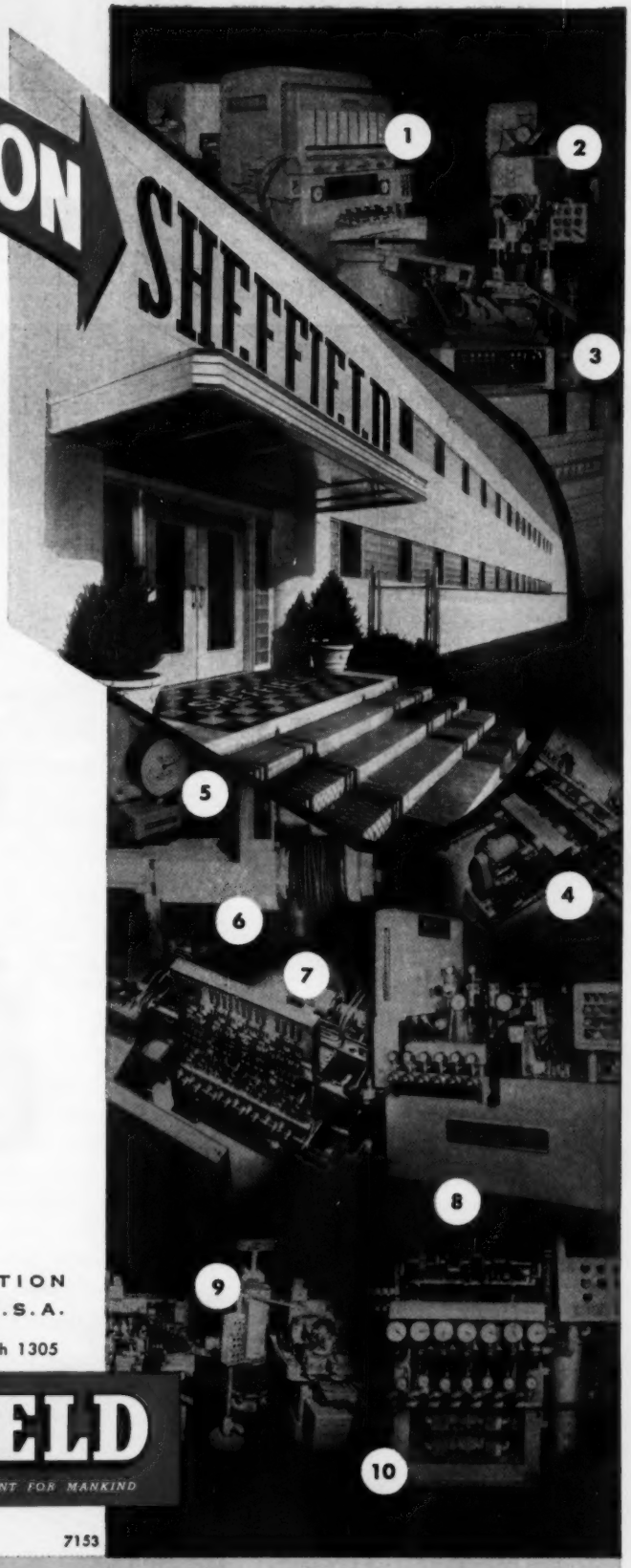
HARDINGE-SJOGREN Chucks and Collets.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

AUTOMATION

AND
AUTOINSPECTION
SYSTEMS, CIRCUITS
AND CONTROLS
HAVE BEEN OUR
BUSINESS FOR
MORE THAN A
DECADE. IT
WILL PAY YOU
TO CHECK YOUR
NEEDS AGAINST
SHEFFIELD
EXPERIENCE



WRITE DIV. 510 FOR BULLETIN NO. AU-1154

THE SHEFFIELD CORPORATION
DAYTON 1, OHIO, U.S.A.
See us at the
Machine Tool Show, Booth 1305

SHEFFIELD HEADQUARTERS MASTER CRAFTSMAN

SHEFFIELD

MANUFACTURING AND MEASUREMENT FOR MANKIND

7153

1. Gaging cylinder bores for selective assembly
2. Controlled honing of gear blank bores
3. Automatic gage for 100% inspection of small arms ammunition
4. Connecting rod inspection
5. Controlling the grinding of ball bearing races
6. Post-process size control of bearing races
7. In-line inspection of automobile part
8. Controlling 12 grinding machines
9. Controlling bore size of pinion blanks
10. Automatic gaging of crankshaft main bearings

Bremen Bearings, Inc., uses SUPERLA

Soluble Oil to give bearings the clean, cool treatment

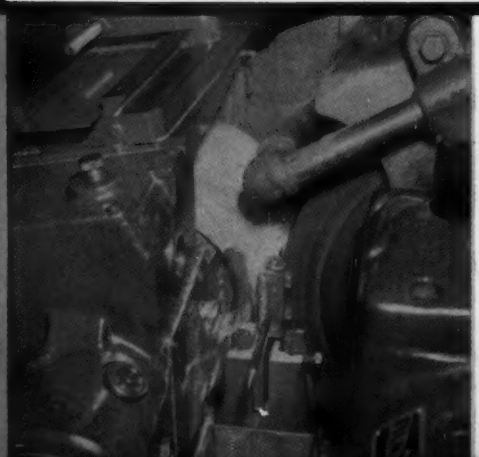
PRECISION NEEDLE BEARINGS are the exclusive product of Bremen Bearings, Inc., Bremen, Indiana. SUPERLA Soluble Oil is used exclusively in all eight of the Company's Cincinnati Centerless Grinders. Plant management experimented with various soluble oils before settling on SUPERLA. They found none could compare with SUPERLA Soluble Oil with respect to wheel loading, stability and tool machine cleanliness.

Plus these benefits, Bremen found SUPERLA mixed readily with water regardless of degree of hardness. The Company found, too, that they got longer tool life and maximum rust protection for work and machines.

You will have the same experience with SUPERLA Soluble Oil. Find out. Inquire of your Standard Oil lubrication specialist. In the Midwest call your nearby Standard Oil office. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

Franklin D. Clark (right), Sales Manager, Bremen Bearings, Inc., and Standard Oil lubrication specialist E. A. Hunt, inspect needle bearing. Gene Hunt is well qualified to assist industrial plants on lubrication problems. In addition to his three years' experience in industrial lubrication sales work, Gene has an M. E. degree from Purdue and has completed the Standard Oil Sales Engineering School. Customers find this experience and training pay off *for them*.

Bearings being ejected from Cincinnati Centerless Grinder at Bremen Bearings, Inc. The Company manufactures needle and spindle bearings to customers' specifications in sizes from 1/16 to ½ inch with tolerances of .0001" and finishes to 3 micro-inches. SUPERLA Soluble Oil is used on all of Company's grinding machines.

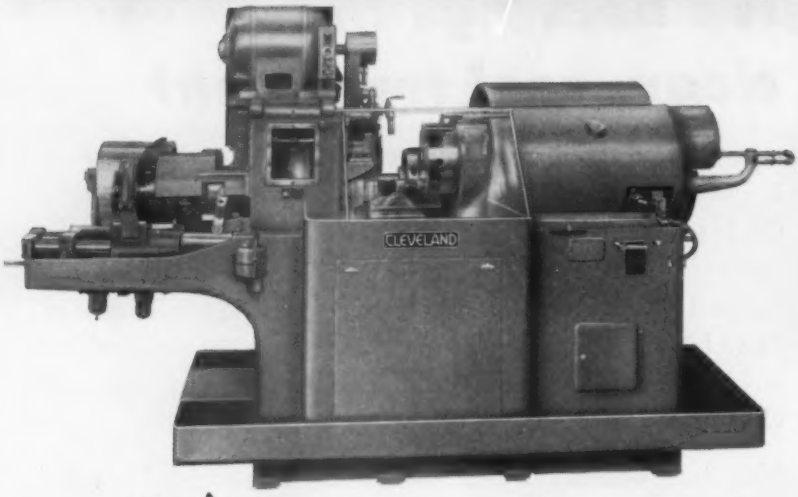


STANDARD

STANDARD OIL COMPANY
(Indiana)

ND FLAT FORM TOOLS • REAMER BLADES • HERRINGBONE GEAR HOBS • ROLLER CHAIN SPROCKET SHAPER CUTTERS • WORM GENERATING AND SPLINE CUTTERS • FORMED MILLING CUTTERS • ROLLER AND STEP DRILLS • WORM GENERATING INVOLUTE GEAR AND SPLINE CUTTERS • SOLID TUNGSTEN C

new CLEVELAND
2½" MODEL "AW" SINGLE SPINDLE AUTOMATIC



CUTS YOUR COSTS 3 WAYS!

More than 65 years of automatic screw machine design experience has been engineered into this new Model "AW" Cleveland. Its many modern features will enable your shop to set new economy records for fast, accurate production of turned and formed parts . . . *and you save three ways:*

YOU SAVE ON BASE PRICE

Your savings start at the *first* cost, as the 2½" Model "AW" is offered at a base price of $3500 to $4000 *less* than other comparable automatics!

YOU SAVE ON SET-UP TIME

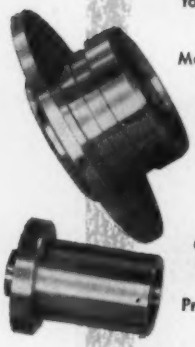
Such features as universal camming . . . rapid hand crank stock feed adjustment . . . quick change collet pads . . . maximum accessibility for tooling . . . make this Cleveland *quick* to set-up and exceptionally economical to operate. Spindle speeds range from 69 to 1920 rpm, providing efficient cutting speeds for all types of materials and tools. Four full automatic speed changes are available. Gear changes are quickly made.

YOU SAVE ON MAINTENANCE AND FREEDOM FROM DOWNTIME

Simplicity is the keynote of this Cleveland design. Completely free from complex mechanism and controls requiring constant attention or adjustments, this rugged, *fool-proof* automatic will assure the user dependable day-in, day-out performance!

To find out how much this new Cleveland can save you on your parts production, ask your Cleveland representative to submit a cost proposal with production estimates based on prints or samples of your work. There is no obligation.

Several examples of typical Model "AW" production are shown here. Note the profitable production rates—the variety of operations performed with simple tooling.



Material: 24ST Aluminum
Operations: Drill (2); C'bore; Ream; Face; Form (2); Cut-off.
Production: 62 pieces/hr.

Material: SAE 2317
Operations: Drill (2); C'bore; Tap; Face; Form (2); Cut-off.
Production: 41 pieces/hr.

Material: FM Brass
Operations: Drill (2); Thread; Bore; Form; Knurl; Cut-off.
Production: 110 pieces/hr.

Material: SAE 4615
Operations: Turn; Form (2); Thread; Center; Face; Chamfer; Cut-off.
Production: 36 pieces/hr.

Material: 24ST Aluminum
Operations: Drill (2); C'bore; Chamfer; Face (2); Form (2); Cut-off.
Production: 80 pieces/hr.

Write for this new bulletin for full details on the 2½" Model "AW" Cleveland

Remember: *Clevelands Cut Costs*

THE CLEVELAND AUTOMATIC MACHINE COMPANY

4928 Beech Street
Cincinnati 12, Ohio

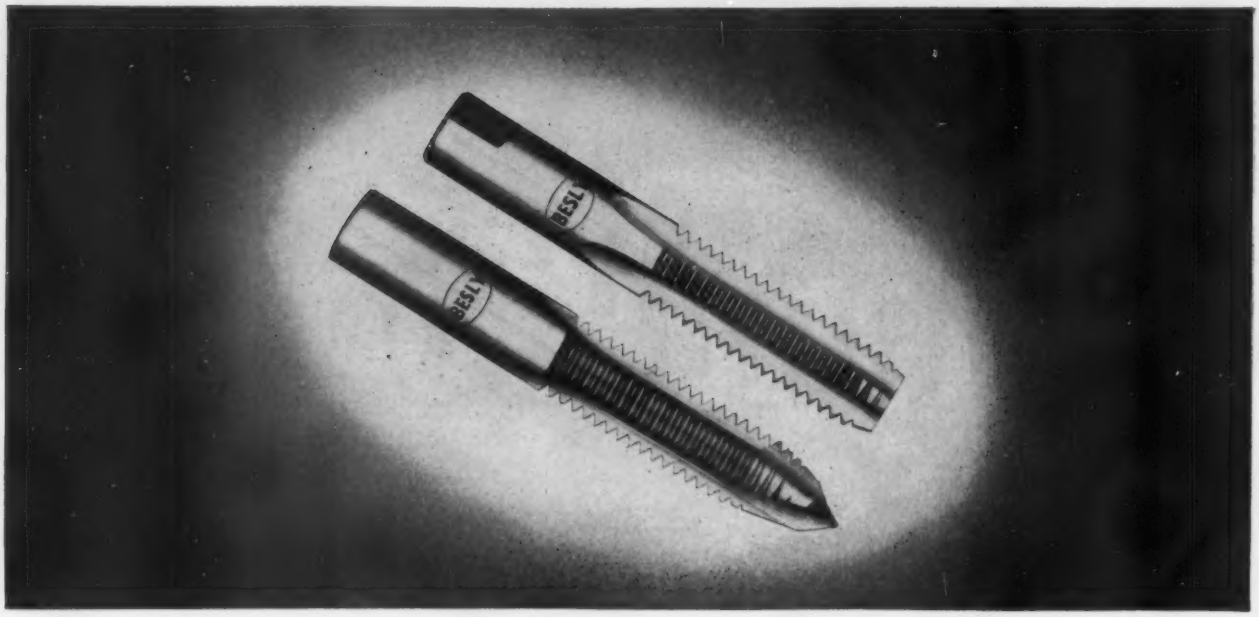
SALES OFFICES: CHICAGO
CLEVELAND • DETROIT
HARTFORD • S. ORANGE

National Tool Co.

Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio



New Besly Stub Tap for Screw Machines

SAVES SET-UP TIME • FITS STANDARD BUSHINGS • HAS STRONGER SHANK

Available at No Extra Cost from BESLY

A new, shorter length tap that need not be altered before use in screw machines has just been made available as a standard item by Besly-Welles Corporation. Developed in cooperation with the National Screw Machine Products Association, the new tap conforms to standards recently drawn up by that group.

SHORTER SHANK, SHORTER THREADED PORTION

The shank (and threaded portions in larger sizes) of the new Stub Tap have been shortened to enable it to fit into the space between the spindle nose and tool holder of screw machines. In the past, it has been necessary for users to cut off part of the shank and even part of the threaded portion of standard hand taps to fit them into screw machines . . . or order higher priced "specials." Now, screw machine operators can save set-up time by using the new Stub Tap just as it comes in the package.

SIMPLIFIES BUSHING INVENTORY

The shank of a Stub Tap is the same size as its nominal O.D. This permits standard sized bushings to be used and reduces bushing inventory problems. The full diameter shank provides greater strength than standard hand taps which have shanks usually turned down in the larger sizes.

FACTORY-PERFECT ACCURACY

The shank of the Stub Tap is made concentric with the threaded portion, assuring accurate alignment in the tool holder. Since it is not necessary to cut off the forward threaded portion of a Stub Tap, chamfer and back taper are maintained factory-perfect. Squares, except for two small driver flats at the end of the Stub Tap, are eliminated. This permits better holding power, better alignment and longer accuracy.

FAST DELIVERY FROM STOCK

Complete stocks of the new Stub Tap will be on hand at Besly distributors by June 1. Users will be able to get the same fast delivery on Stub Taps as they have on other Besly standard taps.

AVAILABLE IN SIZES THROUGH 1-IN.

The new Stub Tap is made in fractional sizes from ¼-in. through 1-in. and in machine screw sizes from #0 through #14. A bulletin describing the new Stub Tap and giving the standards applicable to it is available at no cost or obligation. See your Besly distributor or write or call:

BESLY **BESLY-WELLES CORPORATION**
120 DEARBORN AVE., BELOIT, WISCONSIN
Telephone: DUnkirk 9-2231
In Chicago: 184 North Wacker Drive
Telephone: FRanklin 2-1222
In Cleveland: 1474 Lakeside Avenue
Telephone: PRospect 1-6250
In Detroit: 16509 Meyers Road
Telephone: UNiversity 3-4805

BESLY HAS THE COMPLETE LINE

Standard and Special Taps | Reamers and End Mills | Twist Drills | Sockets and Tool Bits

Order all of your cutting tool needs for your screw machines from your Besly distributor—your quality source for a complete line that means long life, accurate cutting and lower tool costs.

ORNER ROUNDING CUTTERS • SPUR AND HELICAL GEARS • SPUR AND HELICAL MILLING CUTTERS • SPUR AND ROLLING GEARS • FORMED RELIEF CUTTERS • ANGL

No. 4 in a series

CONE

WITH

You get demonstration of your work and complete job development record

UP

Cone submits samples of your work

STEP

Cone makes recommendations

You send print to Cone

No "automatic" user can afford to be out of touch with the latest developments in the use of carbide tools.

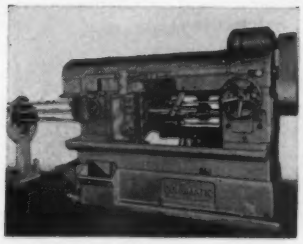
The popularity of the Conomatic Carbide Development program has made necessary larger quarters for increased clientele accommodation.

This innovational Cone service is without obligation of machine purchase and is available to users of any brand of multiple spindle automatic.

It costs nothing to know just how profitable your work might be with modern machines, tools, and know-how.

DATA FOR COMPARISON

Part.....Spec. Cap Screw	Length.....4 17/32" Cutoff 2" Thread
Machine.....1⅝" Conomatic	
Tools.....100% Carbide Tipped	RPM.....885 Work Spdl. 580 Th'd Spdl. 1465 Total Eff'd.
Material.....8742	
Stock Size.....1" Across Flats	Time.....14 Secs.



Conomatic

Send for particulars on "Four Steps With Cone"

CONE AUTOMATIC MACHINE COMPANY, INC., WINDSOR, VT., U.S.A.

TAPS *and* GAGES *by* CARD

Now, Card brings you a select line of gages along with renowned Card taps. You can specify and use both with complete confidence, knowing that whatever the job demands, you'll get top performance. We assure you that the new line of gages boasts the same quality of manufacture that has made Card taps famous over the past 81 years.

Contact your local Card Distributor for prompt deliveries and helpful service.

The CARD Quality

S. W. CARD MANUFACTURING CO. MANSFIELD, MASS.

Division of Union Twist Drill Co. TAPS · DIES · SCREW PLATES · GAGES

DRAWING KOVAR, a special alloy steel that's considered difficult to draw, is easy with this 35-ton Denison Multipress. And, set-up takes only a few minutes.

Some of the various electronic parts formed by Multipress at Amperex.

Quick die changes with DENISON MULTIPRESS® saves manhours

A way to cut costs on short-run metal-forming

SHORT RUNS, frequent die changes. That was the production problem at Amperex Electronic Corporation, Hicksville, New York.

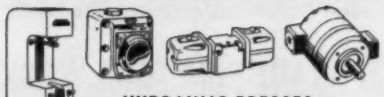
Now, Denison hydraulic Multipress makes set-ups faster than possible with fixed-stroke presses. With Multipress inching control, the ram can be inched to the convenient point for attaching dies. And the smooth, variable hydraulic stroke gives set-up men perfect control of the ram.

Amperex uses three Multipresses for blanking, piercing, forming, drawing and broaching steel and nonferrous metals . . . to produce a wide variety of shapes and sizes.

This is one example among many where Multipress is cutting costs in the 1-to-75-ton pressure range. For help on your particular application, call a Denison Hydraulic Engineer.

THE
DENISON ENGINEERING COMPANY
1164 Dublin Road, Columbus 16, Ohio

DENISON Hydr OIL ics



HYDRAULIC PRESSES
PUMPS • MOTORS • CONTROLS

you'll want COMPLETE DETAILS on these Reducers

...they're in a CLASS by themselves

PHILLIE GEAR®

just send for 48 page CATALOG H-49

. . . in the meantime, note the following features of this Philadelphia Double Herringbone Reducer:

Symmetrical arrangement and balance of gears in relation to the centerline of housing (as compared to usual offset method).

First reduction is through double Helical Gears and pinions, and *Final reduction* is through continuous tooth Herringbone Gear and Pinion. *Anti-friction bearings* of generous proportions, on the ends of each shaft, help absorb the load equally.

Husky, spacious housing, well ribbed and properly sized to give an adequate oil reservoir and large radiating surface for thermal capacity.

These are a few of the exclusive and proven features that have made Philadelphia Units a leader in the field for years.

These Units are available in Single, Double and Triple Reductions . . . ratios from 1.75 to 1 in the Single Unit — up to 292 to 1 in the Triple Unit. Be sure to send for 48 page Catalog H-49.

PHILADELPHIA GEAR WORKS, INC.

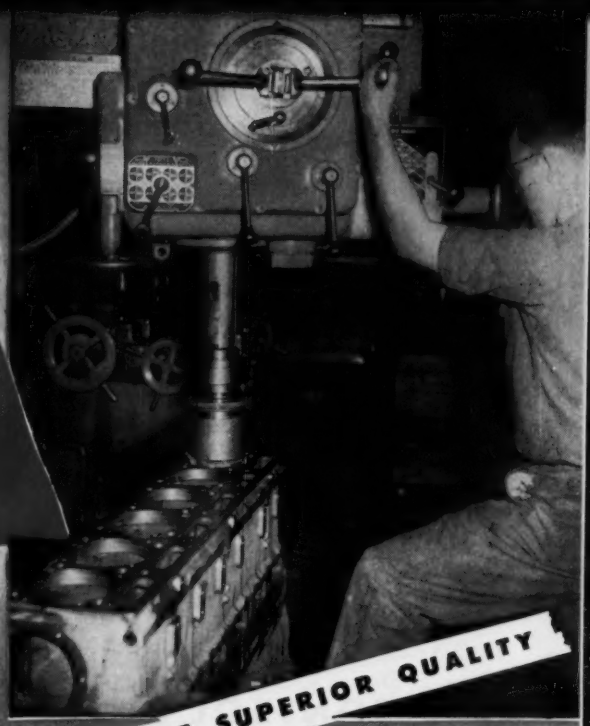
ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
Va. Gear & Machine Corp.

Industrial Gears & Speed Reducers

LimiTorque Valve Controls

Established 1892

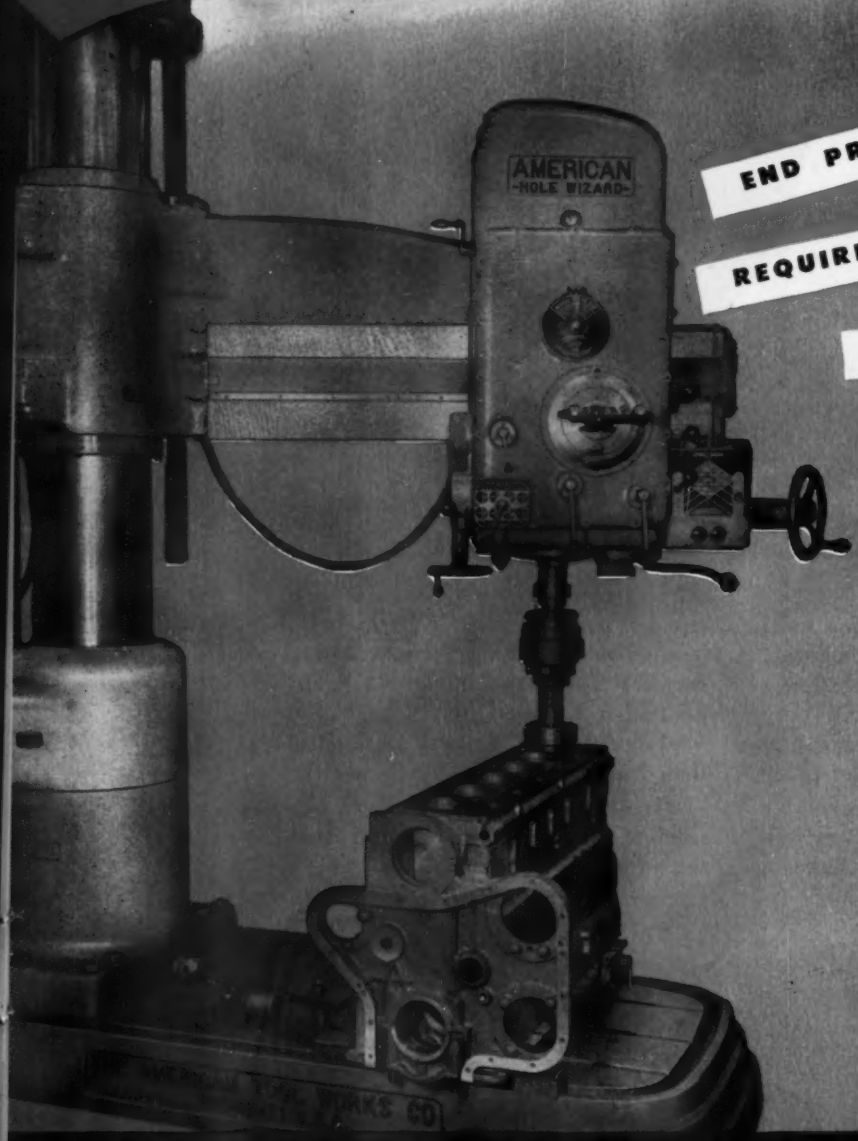
The 2 are inseparable—



END PRODUCTS OF SUPERIOR QUALITY

REQUIRE SUPER QUALITY EQUIPMENT

TO PRODUCE THEM . . .



For six years this "AMERICAN" Hole Wizard Radial has been counterboring "Cummins" Diesel Engine Blocks and holding the required depth tolerance of .001″ in the 6.125″ counterbores. Furthermore, the operator testifies to the fact that the machine is convenient and easy to operate and maintenance has been negligible.

The quality of "Cummins" products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

16 surfaces

...on this Garrison Gear Chuck

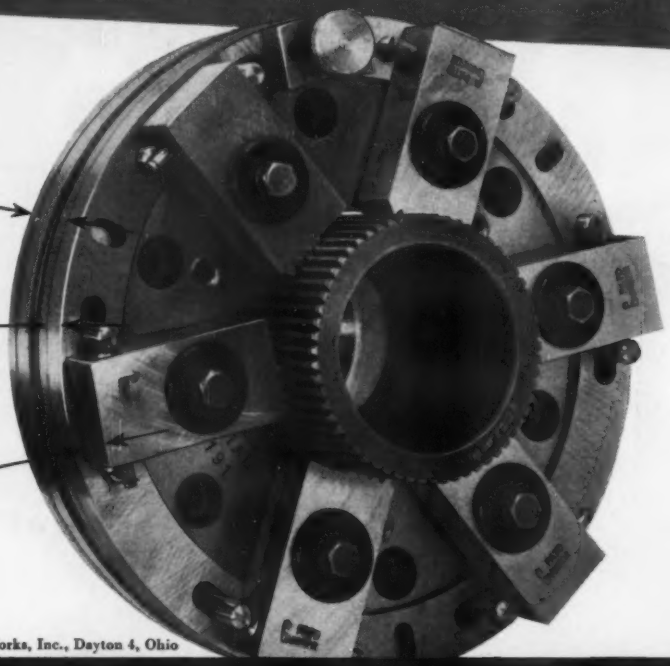


Photo courtesy of Garrison Machine Works, Inc., Dayton 4, Ohio

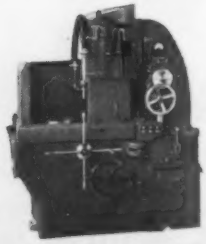
are Blanchard ground for precision

As every machinist knows, machine tools impart their precision through their chucks. That's why chuck dimensions and tolerances are of critical importance . . . and why Blanchard Surface Grinders are commonly used to produce the flat surfaces required.

Blanchard Surface Grinders are ideal for all kinds of precision grinding jobs. They produce extremely close tolerances for flatness, size and parallelism . . . *at low costs and high production rates.* Many Blanchard users grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002", and surface finish to better than 3 micro inches.

Whether your work involves precision machining or rapid removal of stock, take the advice of master machinists . . .

PUT IT ON THE BLANCHARD



No. 11 Blanchard Surface Grinder

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.

carbides?

IMPELLER HUB — 4" diam., 1¼" long, from SAE 1146 annealed steel forging. JOB ANALYSIS determined multiple-spindle chuckers with ALL CARBIDE tooling.

11 operations on first side, on 6" Acme-Gridley 8-spindle chucker with double indexing and duplicate tooling. 2 pieces per cycle in 22½ seconds machine time — 320 pieces per hour.

17 operations on other side on single indexing 6" Acme-Gridley 8-spindle chucker. 26 seconds machine time — 138 pieces per hour.

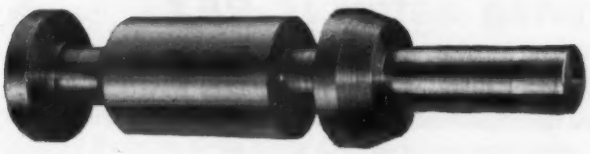
high speed?

SEAL RING — ½" thick, from 2½" diam. steel 6150 annealed. JOB ANALYSIS classed this as single-spindle job with HSS tooling.

5 shoulders rough and finish-formed to .002 tolerance, seat diam. held to .0005 tolerance, on 3½" single-spindle Acme-Gridley bar-type turret lathe. 7 minutes machine time — 8 (plus) pieces per hour.

Spindle speed automatically changed 4 times during cycle to provide suitable speeds and feeds for required finish.

or BOTH?



SHAFT — 7¾" long, from 1⅞" diam. steel 6250 annealed. JOB ANALYSIS indicated single-spindle bar-type turret lathe, with part CARBIDE and part HSS tooling.

10 operations including deep forming, turning and form-turning on 3½" single-spindle Acme-Gridley bar-type turret lathe: 5 minutes 46 seconds machine time — 9 (plus) pieces per hour.

5 automatic changes of spindle speed during the cycle provided speeds and feeds best suited for using both HSS and Carbide tools.

let the economics of the job dictate the right tooling method

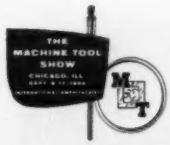
(And the Right Machine)

All Acme-Gridleys are built with a rigidity factor to withstand the pressure of any cutting tool yet devised—at speeds as fast as modern cutting tools can "take it." With such a margin of power, speed and stamina built into each of National Acme's COMPLETE LINE of multiple- and single-spindle bar and chuck-type automatics, you can safely let the *economics* of the job dictate:

1. **The best tooling method.**
2. **The machine best suited to produce the job most economically.**

And you can be equally sure that tooling recommendations from National Acme will be based upon sound, experienced judgement.

If you would like a complete job analysis we'd be glad to give you the benefit of our experience.



BOOTHS 324 AND 705

You can see National Acme's **COMPLETE LINE IN ACTION** at the Machine Tool Show. Study these modern machines. Ask questions. Then you'll learn why Acme-Gridleys are your best investment — for greater productivity today, and to maintain "new-machine-productivity" longer.

OUR JOB: to provide the *Right Machine* for **YOUR JOB**

Acme-Gridley 4, 6 and 8 Spindle Automatic Bar and Chucking Machines • Fully Automatic Turret Lathes (Bar and Chuck Type) • Hydraulic Thread Rolling Machines • Automatic Threading Tools • Switches • Solenoids • Contract Manufacturing.

THE NATIONAL ACME COMPANY

171 EAST 131st STREET • CLEVELAND 8, OHIO

one is always out front

...and with high speed steels the pace setter is REX

Crucible's REX high speed steels have been way out in front ever since their introduction. And today they're still the *standard for comparison* wherever high speed steels are used.

There are many good reasons for REX's leadership — uniformity of size, structure, finish, response to heat treatment, tool performance. Each factor can be proved in your own shop, on your own work. So try this *standard for comparison* on a few jobs and you'll agree with thousands of users — *you can't find a high speed steel to outperform REX.*

Because of its extensive, nationwide use, REX high speed steel is carried in stock by the coast-to-coast chain of Crucible warehouses, or is available on quick mill delivery. *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

This 4-ledged Taft-Peirce Granite Surface Plate is made of high quality Blue-White Granite. Evenly distributed quartz and feldspar grains stand up under long, hard wear. The mica flakes are extremely fine. The plate is free from residual stresses and will not distort with temperature changes. T-P precision grinding and lapping produce the most accurate surface available to industry today.

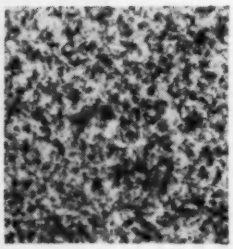
How to Select a Granite Surface Plate

More Tips from TAFT-PEIRCE on Toolroom Equipment

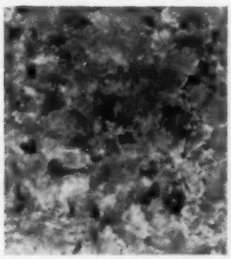
The word "Granite" is at best a vague specification for surface plates. There are many types of granite plates available, and not all are particularly well-suited for long and accurate service. Some granite surface plates wear less, chip less, maintain their accuracy longer than others. Fortunately it is easy to distinguish various kinds of granite by their surface appearance. The four unretouched photographs (enlarged to twice natural size) of several types of granite show what to look for when judging the quality of a granite surface plate.

Best quality granite is almost indestructible. Taft-Peirce Granite Surface Plates are made of very fine-grained Blue-White Granite. Heavy objects dropped on the surface barely powder the stone at *point* of impact.

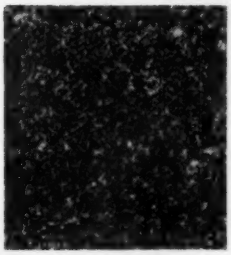
All Taft-Peirce Granite Surface Plates are carefully ground and lapped flat. More than 75 years of experience in making precision products assure maximum accuracy for layout and inspection work. For more information on Taft-Peirce Surface Plates, write for your free copy of the Taft-Peirce Handbook.



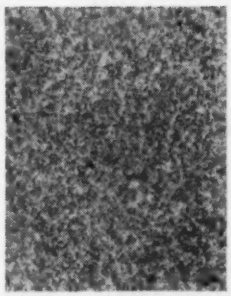
This photograph of gray granite shows the coarse distribution of quartz and feldspar grains, and the larger mica flakes. These clusters of mica wear rapidly and flake out, making larger pits and destroying surface accuracy.



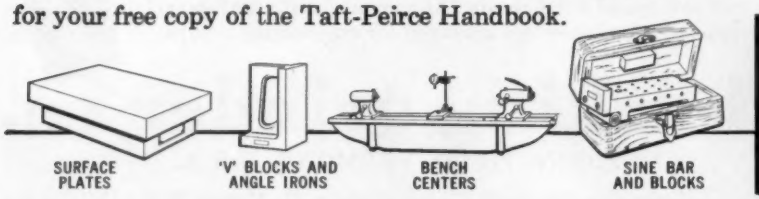
This pink granite has less mica and noticeably larger grains of quartz and feldspar, roughly scattered. Note the coarse, irregular texture of this granite.



Black diabase is composed chiefly of feldspar, hornblende, pyroxene, and black mica, with little or no quartz. These minerals are not quite as hard as quartz, and the mica, especially, flakes out with wear.



This photograph of a Taft-Peirce Granite Surface Plate shows the close, fine-grained texture of quartz and feldspars and the even distribution of extremely small mica particles. This Blue-White Granite from Westerly, R. I., will give long, accurate service.

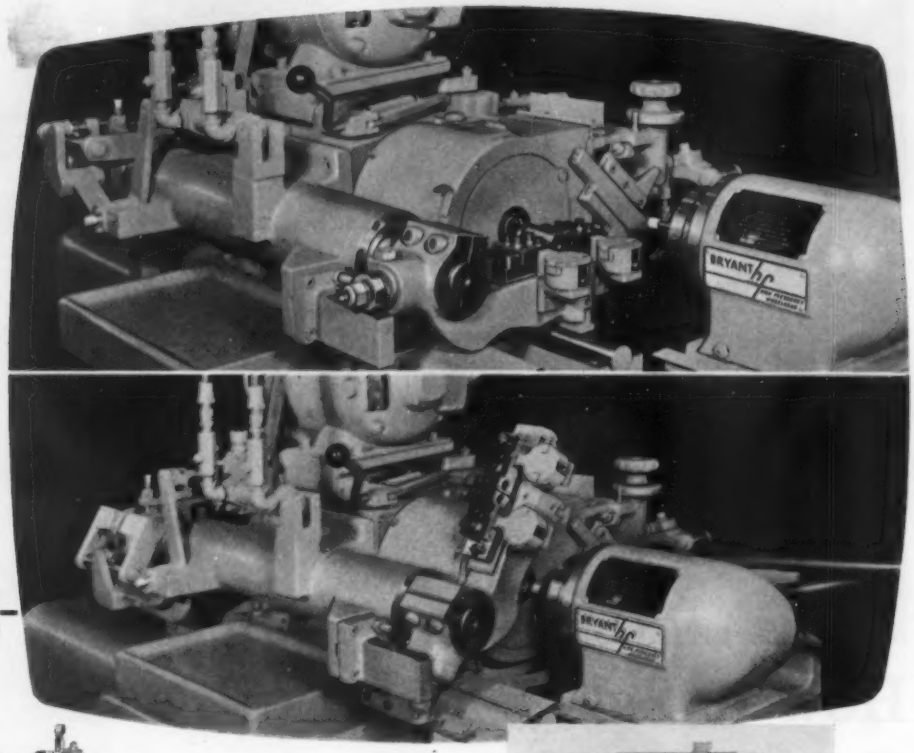


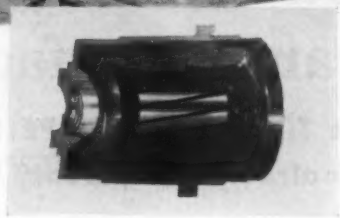
T-P means Top Precision

T P

THE TAFT-PEIRCE MANUFACTURING COMPANY, WOONSOCKET, R. I.

To cut costs and save rehandling-





BRYANT internal grinder . . . combines boring and grinding operations

These photos show how a Bryant Internal Grinder eliminates rechucking of workpieces, resulting in increased production and reduced scrap at Bendix Aviation Corporation's Eclipse-Pioneer Division.

Here, a Bryant model 1209-Y speeds up a fast moving production line by performing both boring and grinding operations on synchro motor housings. Single point carbide tools bore two holes and a face simultaneously in each housing. The grinding operation consists of grinding the stator bore. A fine ground finish is necessary to eliminate possible burrs in the stator slots which could cause failures. Bryant precision alignment assures concentricity held well within the required .0003" tolerance for size, roundness and concentricity. This method has resulted in cutting scrap more than 50% over previous methods used.

Fully automatic Bryant grinders featuring automatic loading and sizing can be readily integrated into your automated production lines. Models ideally suited for tool room and small lot work are also available.

Bryant grinders offer you operating economy—at peak production rates. Their adjustable precision alignment ensures maximum accuracy and minimum maintenance—factors that cut cost per piece.

Write for our free Alignment booklet. Ask, too, for a reservation card for our new sound color movie "Alignment for Better Internal Grinding"—free showings arranged for engineering groups.

BRYANT

chucking grinder co.

SPRINGFIELD, VERMONT, U.S.A.

Offices: Indianapolis • Cleveland • Chicago • Detroit • Mt. Vernon, N. Y. • Philadelphia

Internal Grinders • Boring Machines • Internal & External Thread Gages • Granite Surface Plates

... make tracks

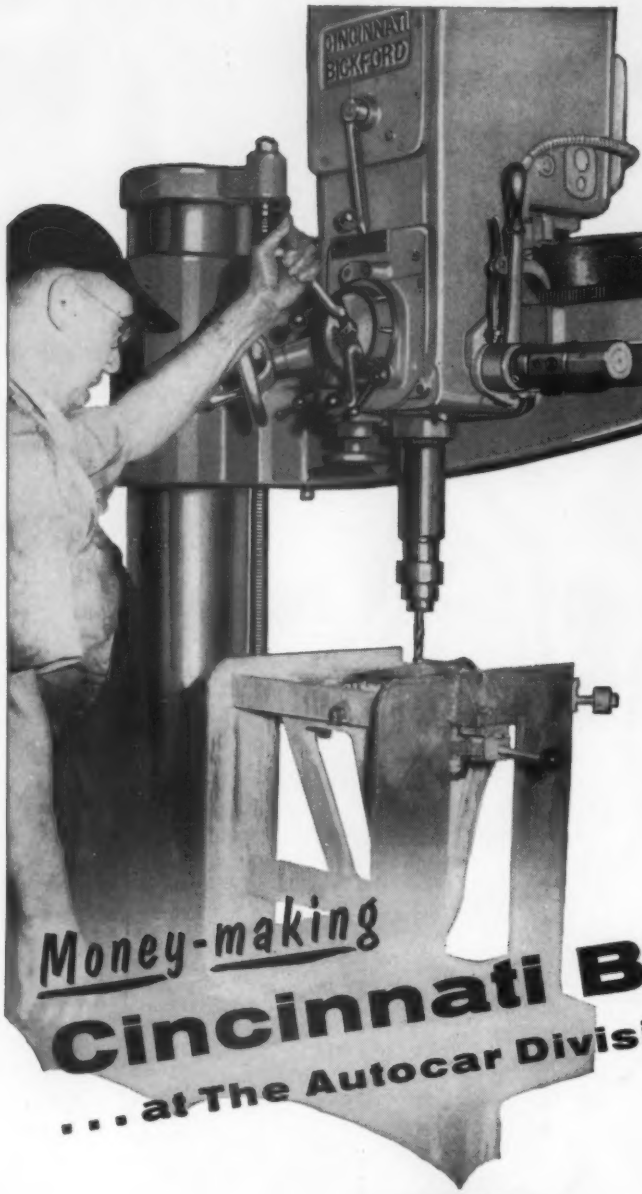
TO YOUR

Threadwell

DISTRIBUTOR

FOR THE FINEST IN
CUTTING TOOLS AND GAGES

Made by THREADWELL, Greenfield, Mass.



The 9" dia. column 3' arm Cincinnati Super Service Radial is working on chassis frame parts and aluminum steering column brackets; ¼" dia. to 1¼" holes drilled and reamed to a .0015" tolerance.

The Upright Drill shown is one of six 28" Super Service Uprights working on heat treated alloy steel frames.

Money-making Cincinnati Bickford machines ... at The Autocar Division, WHITE MOTOR CO. —EXTON, PA.

Photos courtesy the Autocar Division of The White Motor Company, Exton, Pennsylvania.

Speed and easy handling—power and accurate, steady performance were factors in the selection of Cincinnati Bickford Super Service Radial and Upright Drills in this plant. They are quickly adaptable to a variety of operations, including drilling, reaming, tapping and trepanning.

For rapid, accurate, dependable production investigate these cost reducing modern drilling machines.

Write for Bulletin R21C.

80 YEARS OF SERVICE

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

YOU CAN'T BUILD TOMORROW'S PROFITS WITH YESTERDAY'S MACHINES

Modernize NOW with P&J

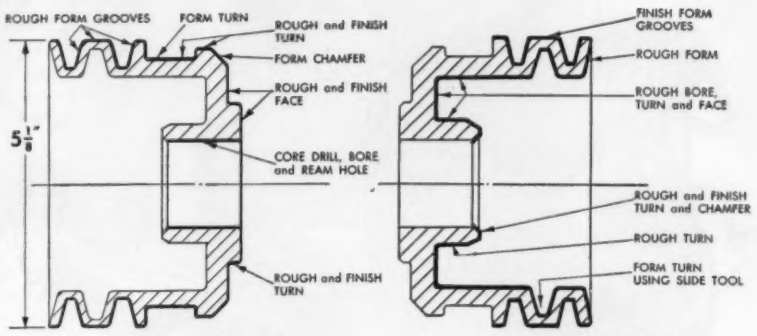
JOB FACTS:

PART . . . . Pulley

SIZE . . . . . Approx. 3¾" long x 5¼" Diam. (Rough Casting)

MATERIAL . . Cast Iron

OPERATIONS All surfaces rough and finish machined. Hole reamed. Twenty-five separate cuts in all.



SURFACES MACHINED ARE INDICATED BY HEAVY LINES

A very real problem that faced a large engine manufacturer was solved by installing MODERN EQUIPMENT. A Potter & Johnston Automatic provided the speed, power and versatility to meet their demands for fast, accurate, low-cost production. Tooling engineered by P&J Specialists took full advantage of combined cuts and faster-cutting carbide tools to reduce machining time to a minimum.

No, you can't handle today's . . . and tomorrow's . . . job requirements on yesterday's machines. Give yourself an extra margin of profit; modernize with Potter & Johnston Automatics . . . and with P&J Tooling. Start today . . . SEND FOR YOUR COPY OF BULLETIN NO. 154 — "34 Practical Production Ideas."

MODERNIZE with POTTER & JOHNSTON REPLACE FOR PROFIT

LET P & J SHOW *You* THE WAY

...SEE US AT BOOTH 1219

POTTER & JOHNSTON CO.

PAWTUCKET, RHODE ISLAND

SUBSIDIARY OF

PRATT & WHITNEY

DIVISION NILES-BEMENT-POND COMPANY

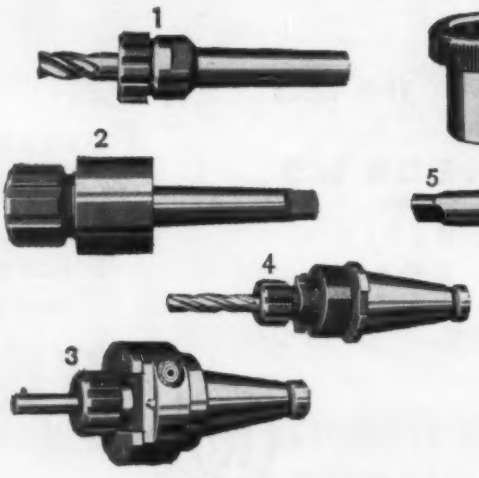
PRECISION PRODUCTION TOOLING P&J FOR MORE THAN FIFTY YEARS

UNIVERSAL DRILL BUSHINGS OUTLAST THEM ALL!

Several factors contribute to the long life of Universal Drill Bushings. blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests help guarantee their accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you — Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis. — or our home office.

180

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 1, MICHIGAN



1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

Efficiency in Cutting-off is Important

Practically all machining operations start with pieces cut-off from bars or billets. Hence, inefficiency, or lack of capacity, in the cut-off department can hold up or stagnate the entire plant.

A. Are all-ball-bearing and provide a quick return; therefore they run FASTER than others on the same work.

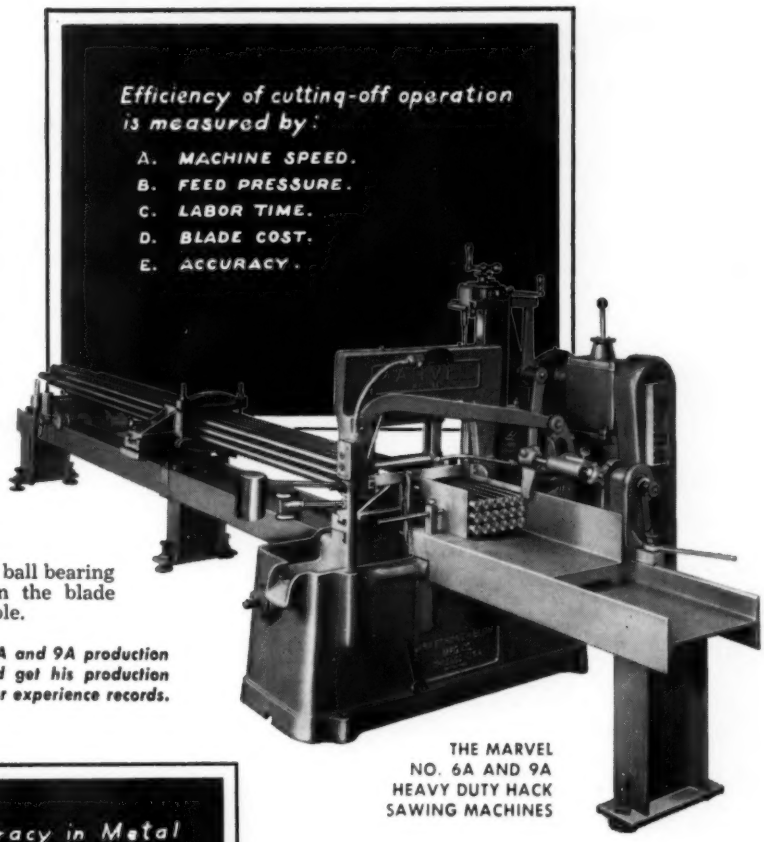
B. Can apply as much as 1200 pounds feed pressure—two to ten times as much as other hack saws and band saws.

C. Are fully automatic, requiring no more operator attention than an automatic screw machine; and set-up for any bar size and cut-off length is extremely simple.

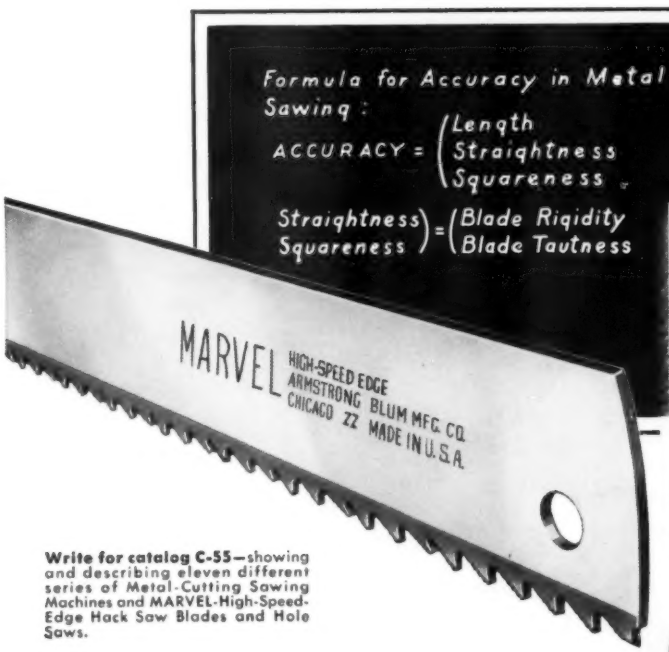
D. Use a non-breakable high speed hack saw blade — the type of saw blade that produces the greatest number of square inches of metal cut per dollar of blade cost—two to ten times (or more) as much as any band saw.

E. Because of their exceptional sturdiness, ball bearing reciprocating frame, ability to tension the blade "truly taut", their accuracy is dependable.

If you are not using modern, improved MARVEL NO. 6A and 9A production hack saws, call the local MARVEL Field Engineer and get his production and cost estimates on your work—to compare with your experience records.



THE MARVEL NO. 6A AND 9A HEAVY DUTY HACK SAWING MACHINES


Formula for Accuracy in Metal Sawing:
ACCURACY = (Length, Straightness, Squareness)
Straightness, Squareness = (Blade Rigidity, Blade Tautness)
MARVEL
HIGH-SPEED EDGE
ARMSTRONG BLUM MFG. CO.
CHICAGO ZZ MADE IN U.S.A.

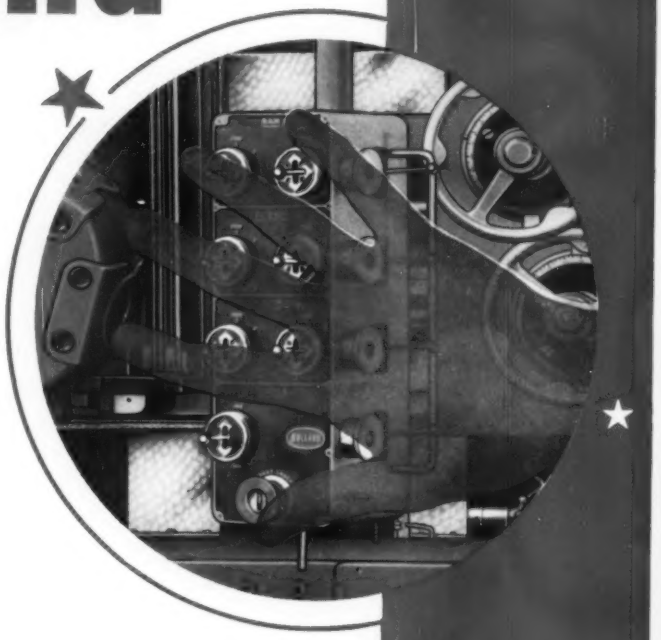
The composite MARVEL High-Speed-Edge Hack Saw Blade—cuts **any** machinable material efficiently. There is no time lost changing blades for different types of steel; no time lost replacing shattered blades, because MARVEL High-Speed-Edge Hack Saw Blades are positively **unbreakable.** These superior blades have the finest high speed steel cutting edge welded to a strong alloy steel body. They will stand-up under the highest speeds and heaviest feeds attainable on any make hack saw. Can be safely tensioned tauter than any other blade—cut-off not only straight but also square and with less stock loss.

Write for catalog C-55—showing and describing eleven different series of Metal-Cutting Sawing Machines and MARVEL-High-Speed-Edge Hack Saw Blades and Hole Saws.

MARVEL Metal Cutting SAWS
Better Machines-Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

Within the Span of a Man's Hand



The power to transmit the commands of the operator to the machine...

By means of the movable PENDANT CONTROL the start and stop of the spindle; selection of speeds, feeds and directional movements of all heads in feed or traverse are quickly and easily accomplished. Interlocks and a stopall stick provide safety for both operator and machine.

Additional features include:

SCREW FEED

for vertical and horizontal motion of all heads—to assure fine smooth finishes with greater accuracy.

POWER INDEXED MAIN TURRET (optional)

Five sided turret for "run of the mill" jobs. Four sided turret for production jobs.

PLAN TO VISIT

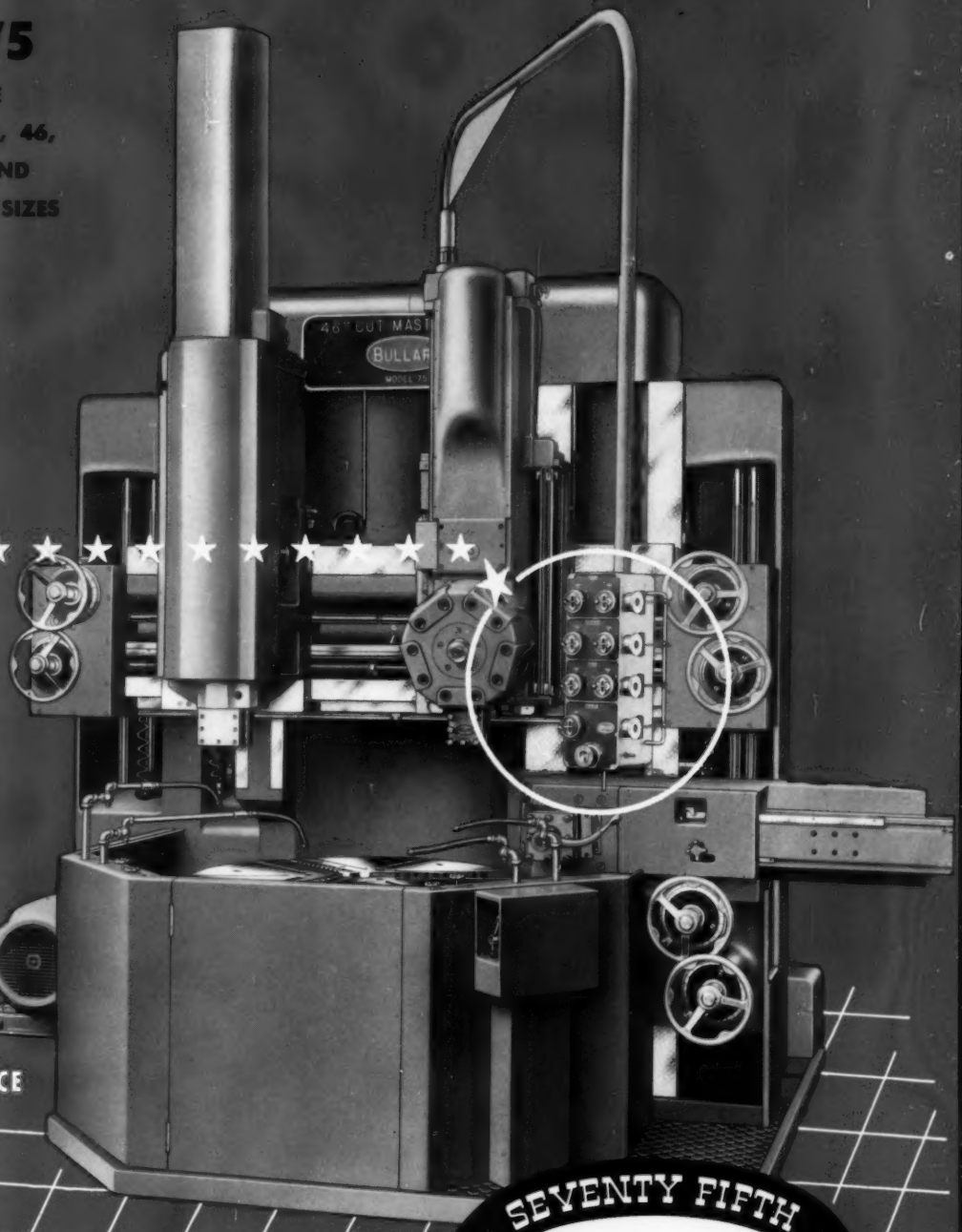
OUR EXHIBIT AT BOOTH 1213

CUT MASTER

VERTICAL TURRET LATHE

Model 75

AVAILABLE
IN 26, 36, 46,
56, 66, AND
76, INCH SIZES



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VK HIGH SPEED STEEL THREAD MEASURING WIRES

...basic tools in a universally accepted method of checking screw threads

VK Set No. 20 HS Thread Measuring Wires, accurate to ±.000025" for 20 common pitch Unified and American screw threads, 6 to 36 threads per inch.

The three-wire method is probably the best known and most widely accepted system of measuring pitch diameter of screw threads. Equipment required includes only a set of VK Thread Measuring Wires of proper diameter and an accurate measuring instrument.

Van Keuren Thread Measuring Wires have been developed over a period of many years of pioneering in the precise measurement field. They are made to National Bureau of Standards specifications, are held within .00002" for roundness, straightness and identity and to within .000025" of exact size.

VK Thread Measuring Wires are made of long-wearing, tough and beautifully finished high speed steel and are either 1⅞" or 2" in length. Every wire is subjected to the closest criteria in today's standards of accuracy.

In addition to set No. 20, shown here, VK furnishes many other standard sets as well as special wires in diameters from .001" to 1.500."

The Van Keuren Catalog and Handbook No. 35 contains 91 pages of technical and engineering information on wire measurement of screw threads. This information, compiled from many years research in the field, is available without charge by addressing: The Van Keuren Co., 173 Waltham St., Watertown, Mass.

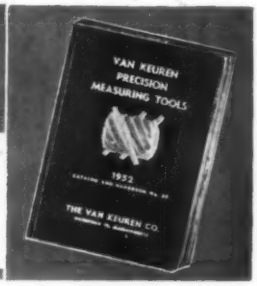
VK

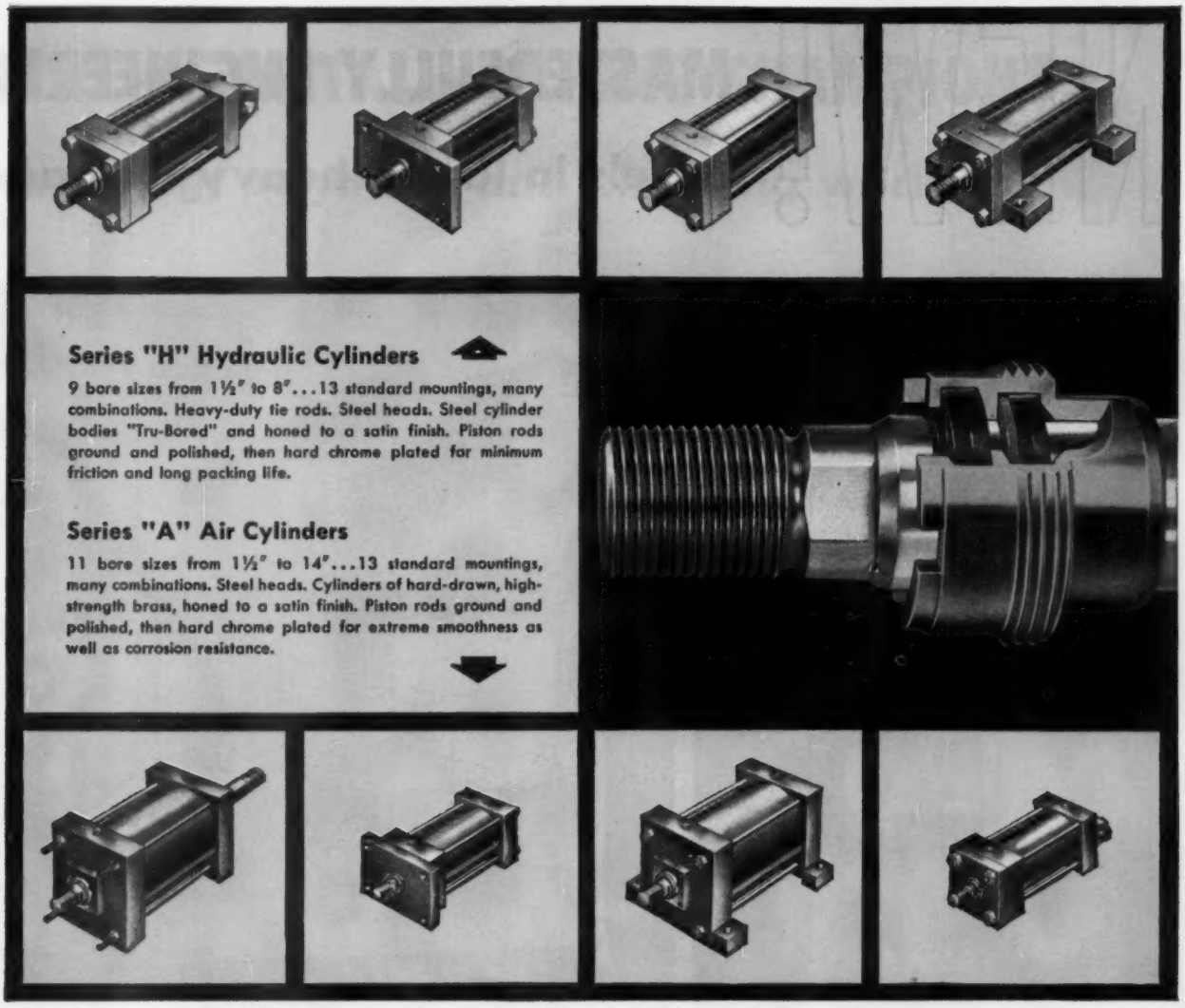
36th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires • Chrome Carbide Taper Insert Plug Gages





Series "H" Hydraulic Cylinders

9 bore sizes from 1½" to 8"...13 standard mountings, many combinations. Heavy-duty tie rods. Steel heads. Steel cylinder bodies "Tru-Bored" and honed to a satin finish. Piston rods ground and polished, then hard chrome plated for minimum friction and long packing life.

Series "A" Air Cylinders

11 bore sizes from 1½" to 14"...13 standard mountings, many combinations. Steel heads. Cylinders of hard-drawn, high-strength brass, honed to a satin finish. Piston rods ground and polished, then hard chrome plated for extreme smoothness as well as corrosion resistance.

Only HANNIFIN Square-Type Cylinders Have This Revolutionary New Gland

The gland you see here represents the biggest improvement in cylinder design in the last 50 years. And, you'll find this gland only in Hannifin Square-Type Air and Hydraulic Cylinders.

This exclusive Hannifin Gland is a bronze cartridge, *externally removable and replaceable as a unit* to meet J.I.C. recommendations. The packing is new, too. Outside is the "Wiperseal." It serves a dual purpose as it *wipes both ways* to provide a dry rod on the out-stroke, a dirt-free rod on the in-stroke. Inside is the "Lipseal"...self-compensating, self-relieving and nonadjustable. It provides an efficient seal throughout its long life.

Find out how easily you can apply Hannifin Cylinders to your requirements. They're available for prompt delivery—in all sizes and all standard mounting styles—and at competitive prices despite all their exclusive features.

WRITE FOR BULLETINS

Bulletin 113. Series "H" Hydraulic Cylinders

Bulletin 213. Series "A" Air Cylinders

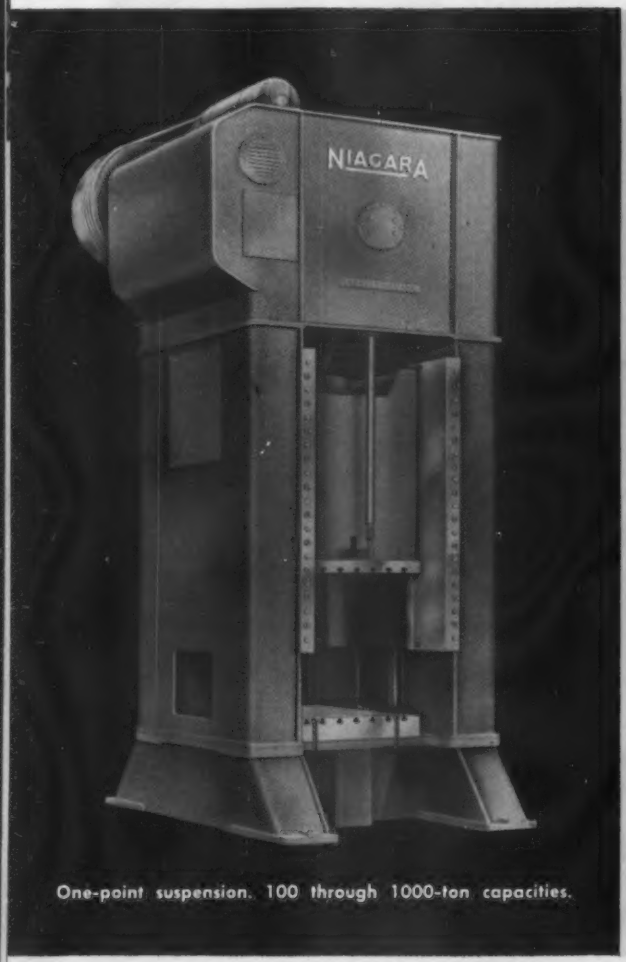
HANNIFIN

Hannifin Corporation, 517 S. Wolf Rd., Des Plaines, Ill.

Air and Hydraulic Cylinders • Hydraulic Power Units • Pneumatic and Hydraulic Presses • Air Control Valves

NEW! MASTERFULLY ENGINEERED

excels in large, heavy tonnage



One-point suspension. 100 through 1000-ton capacities.

Four-point suspension. 200 through 1000-ton capacities.

ECCENTRIC DRIVE DELIVERS GREATER TORQUE WITH LESS DEFLECTION

In Niagara Series SE Presses, the eccentric is an integral part of the main gear (or gears) which rotates on a stationary pin rigidly supported in the crown, close to the point at which the pressure is exerted. Serving merely as a pivot, the pin carries no torsional load and relatively little bending load. Net result: Niagara's eccentric gear design can deliver greater torque with less deflection than other types of construction.

RUGGED, RIGID, ALL-STEEL FRAMES PROVIDE GREATER ACCURACY, LONGER DIE LIFE

Frames are rugged, all-steel, four-piece, tie-rod construction of great strength and rigidity, stress relieved in a furnace and thoroughly grit-blasted before machining. Each frame size has been scientifically tested for deflection to meet Niagara standards — the most exacting in the industry.

LOW INERTIA, PNEUMATIC FRICTION CLUTCH RUNS COOLER, WEARS LONGER

Most of the weight of the Niagara clutch continues to rotate with the flywheel. Only the drive shaft and driving plate start and stop with each cycle. The resulting low weight and inertia of the parts, picked up during clutch engagement, greatly reduce heat and wear. As the clutch rotates, it acts as a centrifugal blower, providing positive ventilation. Plates automatically compensate for normal wear, with no adjustment necessary.

MODERN, STREAMLINED DESIGN EMPHASIZES COMPACTNESS

The entire driving assembly is neatly housed in the crown. There is no exposed, overhanging flywheel, clutch, brake, shaft nor motor in the rear of the press to obstruct crane service, block light, throw grease or consume space unnecessarily.

LINE OF METALWORKING CHAMPIONS

drawing, punching and blanking work

Two-point suspension. 200 through 1000-ton capacities.

Without equal in engineering design, performance and stamina, this great new line of Niagara Straight Side Eccentric Geared Presses is every inch a champion. It is an outstanding example of the advanced thinking that has made Niagara the pace-setter among builders of metal working machines for 75 years.

Masterfully engineered and ruggedly constructed to handle a tremendous variety of work, the new Niagara SE Series is the most practical and dependable press line built for:

- Work requiring large die areas.
- Heavy tonnage demands.
- Long stroke, deep drawing jobs where work is engaged high up on the stroke.
- Bottom-of-stroke blanking and punching.

THE COMPLETE STORY IS READY FOR YOU NOW!
Make a feature-by-feature appraisal of what these great new presses can do for you. Write for newly published, illustrated Bulletin 66. It will be forwarded promptly without obligation.

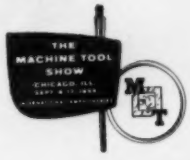
NIAGARA MACHINE & TOOL WORKS • BUFFALO, 11, N.Y.
District Offices: Buffalo • Cleveland • Detroit • New York • Philadelphia
Dealers in principal U. S. cities and major foreign countries.

DELUXE OPERATING CONTROLS INSURE UTMOST SAFETY, EFFICIENCY AND CONVENIENCE

Compactly and conveniently arranged on a master panel, Niagara controls are instantly accessible for fingertip direction of every press operation: starting, slide adjusting, jogging, die tryouts, running and stopping. The latest safety devices provide maximum protection for die setter, operator and the press itself. Nothing has been overlooked. Trial runs assure that all controls are in proper working order before each Niagara press leaves the plant.

NIAGARA

STRAIGHT SIDE
ECCENTRIC GEARED
PRESSES

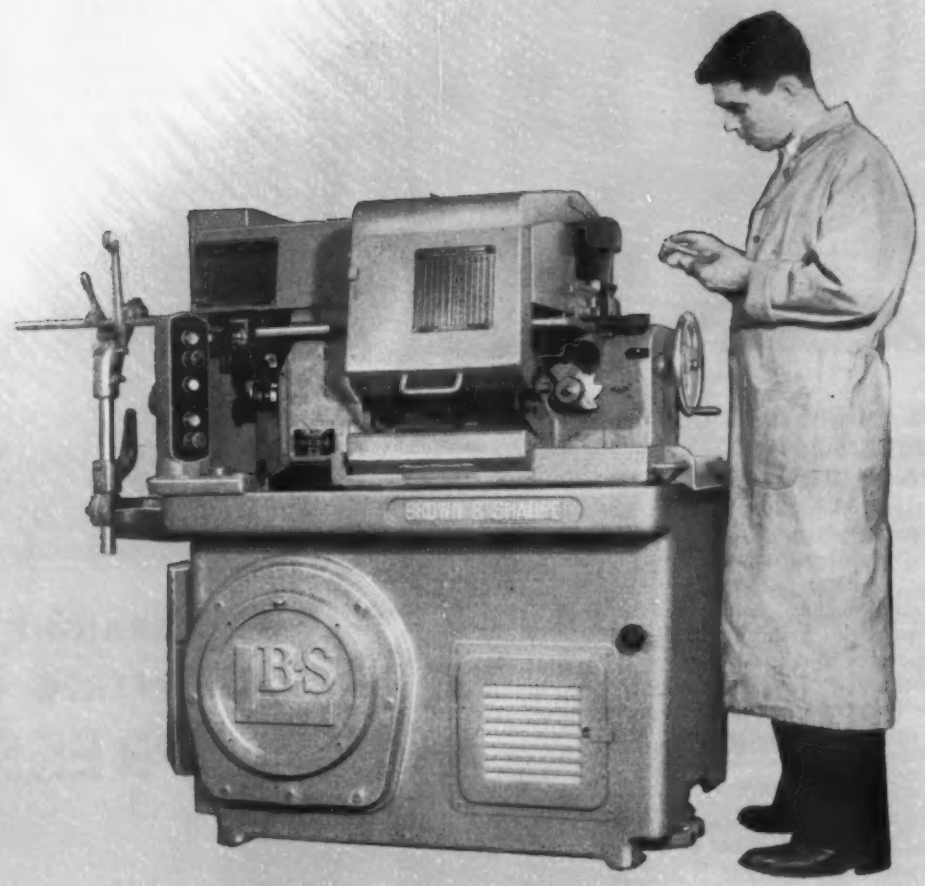


America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

NOW! . . . fastest automatic in its range!

. . . as much as **40%**

HIGHER



higher speed

Speed Range from 7200 to 34 rpm.
208 Spindle Speed Combinations for stock up to ½" diam.

higher capacity

Turning Length to 1"; up to 1½" with extra equipment.

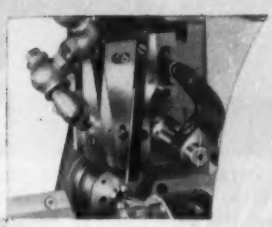
higher rigidity

Cross Slides and Detachable Ways of hardened, ground steel.

The most advanced automatic on the market for stock up to ½"! Push-button controlled. Actually increases output as much as 40% on many jobs — steps up others correspondingly. It's the new Brown & Sharpe No. 00 Automatic Screw Machine. Exclusive design features provide faster, easier set-ups . . . exceptional speed and turning capacity . . . outstanding accuracy . . .

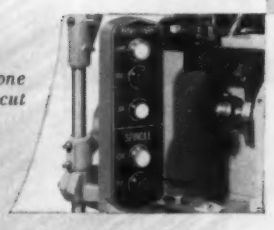
OUTPUT

. . . permit carbide tooling where desirable. The most versatile, productive automatic in its range . . . assures highest cutting efficiency on all precision work. Write for full details. Brown & Sharpe Manufacturing Co., Providence 1, Rhode Island.



Improved Vertical Tool Slide, for extra tool position, is standard equipment.

Driveshaft driven by 2 pick-off gears — no belts. Safety device prevents rotation in wrong direction.



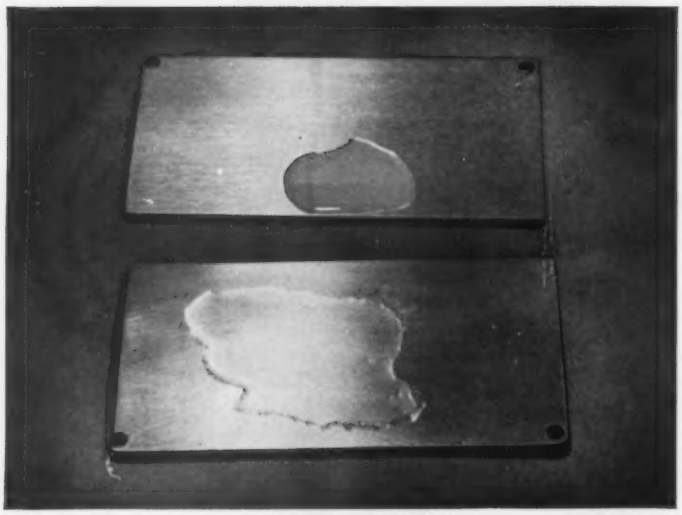
Push-button control — one of several features that cut set-up time materially.

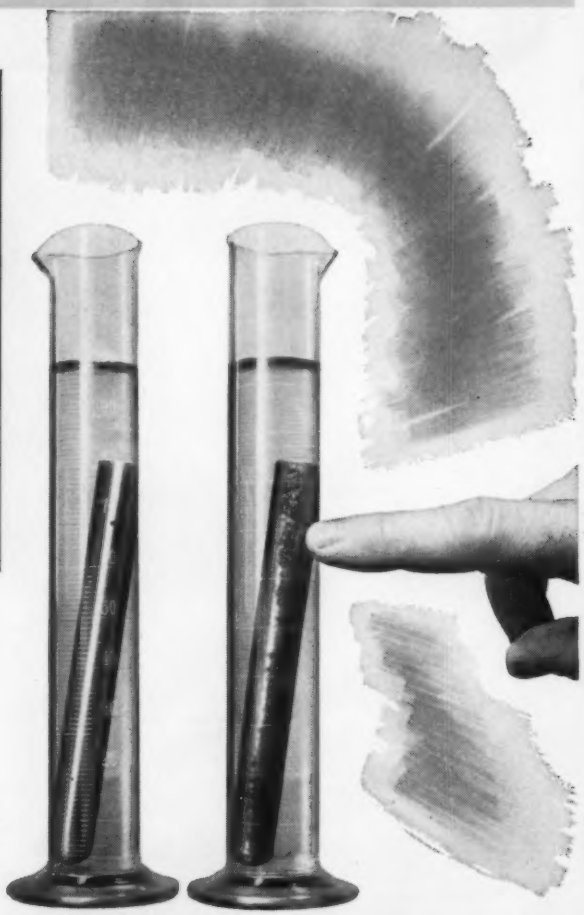
Brown & Sharpe B·S

THE MACHINE TOOL SHOW CHICAGO, ILL. SEPT. 8-17, 1958 INTERNATIONAL EXPOSITION

BOOTH No. 520

Announcing
SHELL
DROMUS OIL E





Above: Cooling action of a cutting fluid is directly related to its wetting ability. Conventional soluble oil emulsion (background) "balls" up. Equal amount of Shell Dromus Oil E spreads out thinly . . . wets far greater area.

Right: Plain carbon steel, if left in water at room temperature for about two hours, will rust as shown. Sample on left was in a 1-30 solution of Shell Dromus Oil E and water *for six months without rusting.*

SHELL DROMUS OIL E

NEW CUTTING OIL

permits higher speeds and faster feeds than ever maintained before

Shell Dromus Oil E, a new solution-type fluid, wets all metal surfaces with extreme rapidity and keeps both work and tools exceptionally cool. These qualities permit an increase of machine speeds and/or feeds far beyond anything allowable with conventional soluble oils.

IT'S MUCH EASIER ON TOOLS

There's much more life in any cutter or abrasive wheel when protected by this new oil. *It stays put* between tool and work. (At a 1-30 dilution, average tool life increase in extended field tests was about 50%.)

IT FIGHTS RUST

Shell Dromus Oil E is readily soluble in hot, cold, soft or hard water, and stable in any concentration. Even at low concentrations, it gives excellent rust protection to all ferrous metals, *including cast iron.*

IT KEEPS WORK COOL

Even at stepped-up production rates, you'll find less heating and better finish wherever this new oil is used.

IT SETTLES OUT FAST

Chips and wheel particles settle out immediately . . . the recirculated fluid is clean and free from contaminating particles. It is *not* sticky or greasy . . . leaves no deposits on machines or work.

IT'S GREAT FOR GRINDING

Grinding wheels remain clean, *even when material retains a film of cutting oil from a previous operation.* Even cast iron can be ground cleanly when Shell Dromus Oil E is used to cool the work.

If all this reads "too good to be true," we suggest that you try Shell Dromus Oil E *on any problem operation you have.* It *is* that good!

SHELL OIL COMPANY

50 West 50th Street, New York 20, New York
100 Bush Street, San Francisco 6, California

SHELL

MATTISON

ARMSTRONG
TOOL HOLDERS...
for every operation!

There are ARMSTRONG TOOL Holders in sizes and types for every operation on lathes, planers, slotters and shapers —for the heaviest cuts; for the most delicate cuts.

With Standard shaped cutters, bits and blades of ARMSTRONG HIGH SPEED ARMALOY (Cast Alloy) and ARMIDE (Carbide-Tipped) they provide a system of tooling that assures maximum production per machine hour, lower tool costs, and higher machining profits.

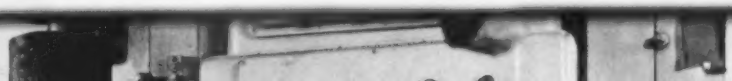
These permanent multi-purpose tools can be picked up as needed from your industrial distributor. Use them wherever possible to increase number of pieces per hour, to lower cost per piece.

Write for Catalog

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. Armstrong Ave. Chicago 30, Ill.



Finishes three faces

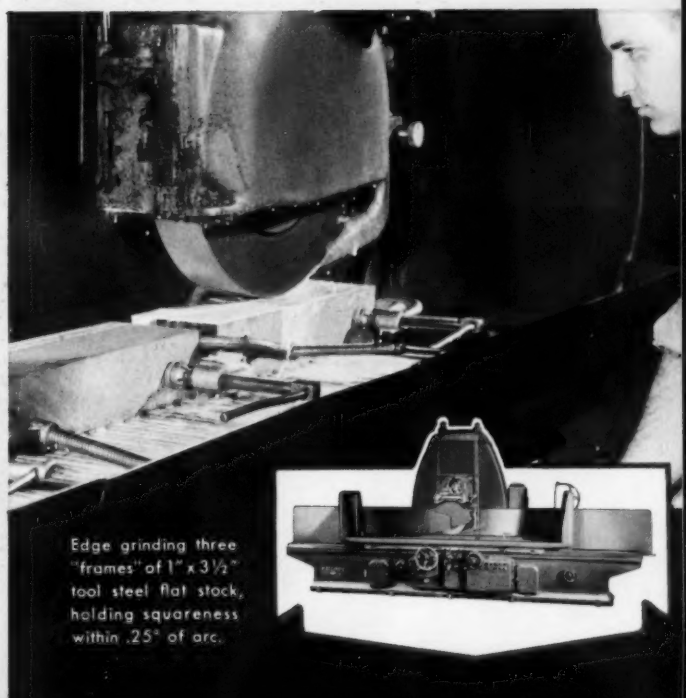
MATTISON GRINDERS

IF IT'S A FLAT SURFACE THERE'S A MATTISON TO GRIND IT!

GRINDING METHODS

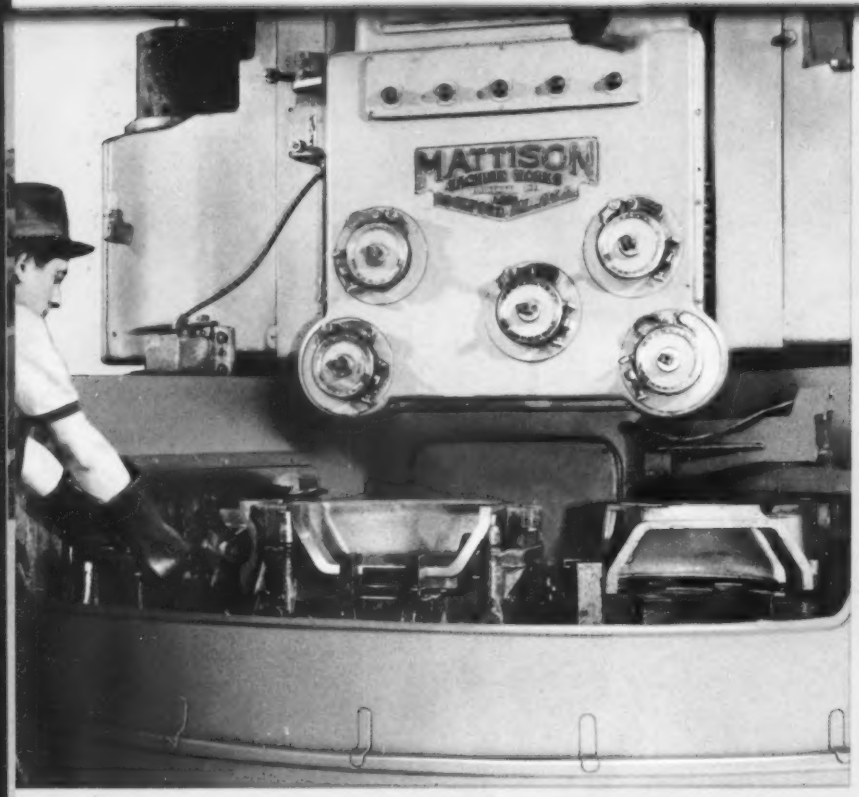
Big grinders profitable investment for small plants!

Starting production in 1945 with one Mattison High-Powered Precision Surface Grinder, Marshall Steel Co. rapidly has grown to be one of the nation's largest single producers of ground flat stock. Today, nine "Mattisons" are the determining factor in Marshall's ability to produce a complete range of standard ground flat stock sizes, exemplifying the profit-power of these versatile machines on jobs requiring: 1) accuracy well within the needs of toolroom work, 2) ability to produce fine finish, and 3) capacity to handle long or short runs and large or small parts with decisive efficiency and ease. If you have a variety of parts requiring flat or contour machining, you can save tool costs, speed production, eliminate roughing operations, and upgrade quality by grinding them on a Mattison High-Powered Precision Surface Grinder. Write for Bulletin "HP."



Edge grinding three "frames" of 1" x 3½" tool steel flat stock, holding squareness within .25" of arc.

Produces extra fine finish on hard tool steel . . . holds

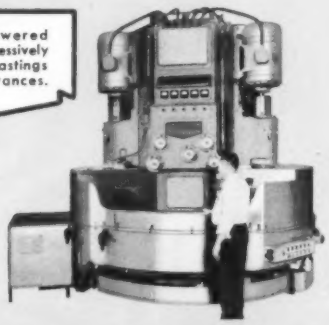


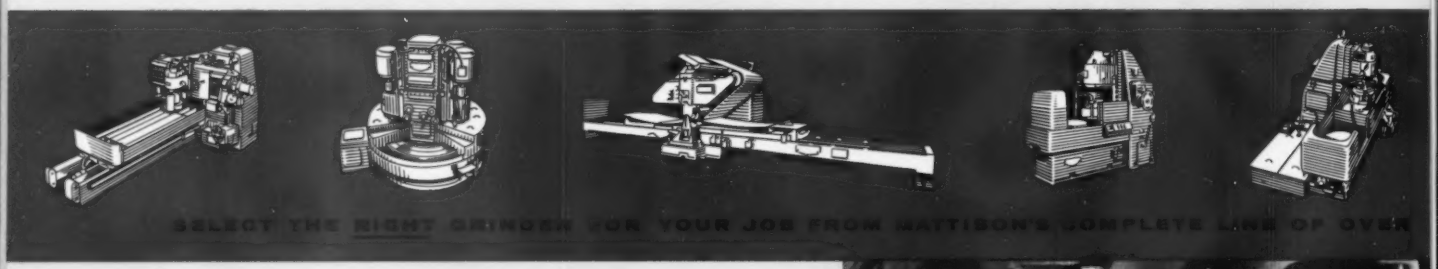
For work up to 16" high and stock removal to .150", the "No. 100" is a high-powered production grinder, with exceptional rigidity and wide work range. Continuous single-pass grinding produces more parts, more accurately, at lower unit cost.

Finishes three faces from rough ... 50 pieces per hour

Sets of three different fixtures on this No. 100 Rotary Automatic permit grinding pan face, engine face, and transmission face of flywheel housings at the rate of 50 finish pieces per hour (150 surfaces). With five grinding wheels powered by 40 hp motors, up to ⅛" stock is easily removed from the rough castings. Automatic compensation for wheel wear eliminates downtime . . . machine is stopped only when wheels are worn behind useful limits. On long run jobs, the Mattison Rotary Automatic is an advanced, high-production method for machining flat surfaces. Write for Bulletin No. 147-2.

Five high-powered spindles progressively finish rough castings to close tolerances.



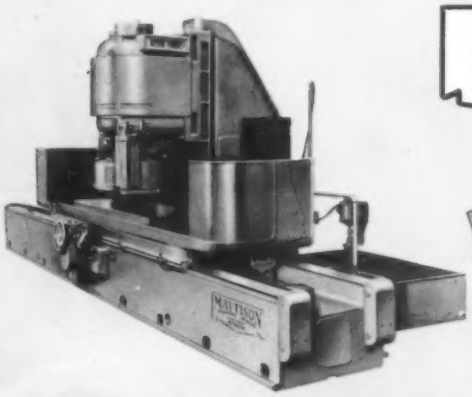


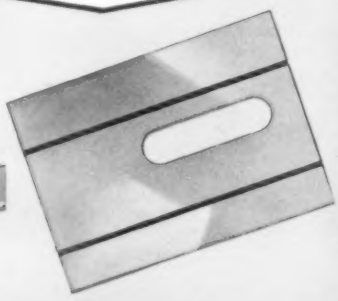
SELECT THE RIGHT GRINDER FOR YOUR JOB FROM MATTISON'S COMPLETE LINE OF OVER

"Cost 60 to 70% lower"... finishing large saw tables

By grinding these cast iron machine tables on the Mattison No. 400SS Vertical Spindle Surface Grinder, production costs are 60 to 70% lower than by other methods. This is because the "400SS" is adequately powered and rigidly constructed for high stock removal when machining large, uninterrupted surfaces. The wheel is constantly self-dressing and free cutting. There's no heat distortion to destroy finish and accuracy . . . no downtime for dressing a "loaded" grinding wheel. These factors, plus extra-wide work table and 25" wheel clearance, make the "400SS" a fast, low-cost method for machining large surfaces. Write for details—Bulletin 847.

28" wide saw tables are ground flat, and within .005" over entire 38" length, using 32" dia. wheel.

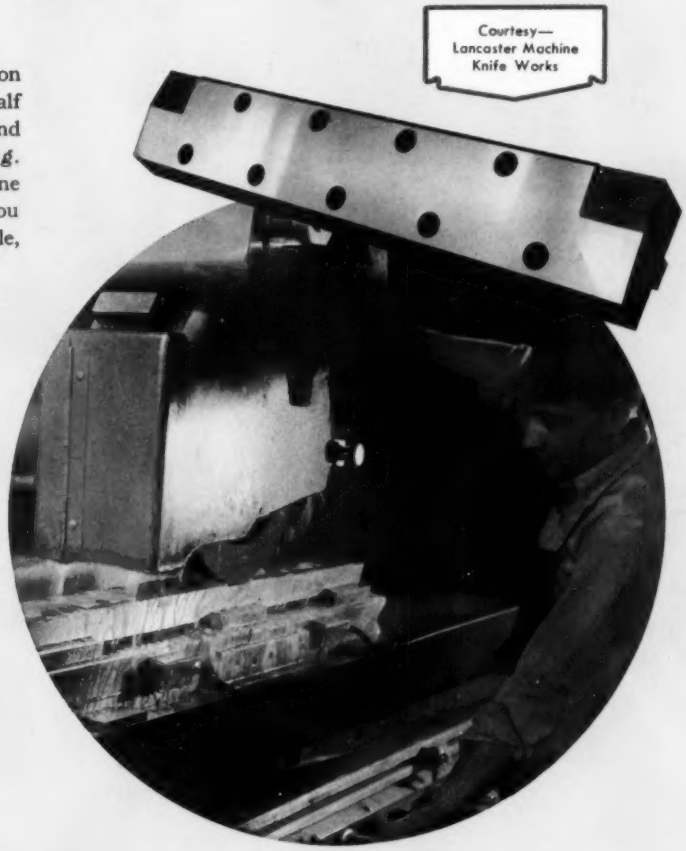


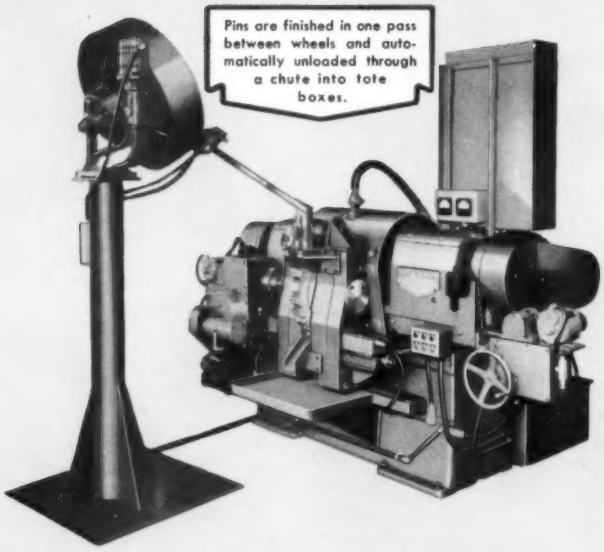


Production is 8 to 12 table tops per hour and 35 to 40 mount pads per hour. Stock removal is .060". Courtesy—Rockwell Manufacturing Co., Delta Power Tools Division.

Produces extra fine finish on hard tool steel... holds form within .001"

Tool steel toggle cam shoes are form ground on this Mattison High-Powered Precision Surface Grinder in less than half the time required on a tool grinder. Two shoes are ground per load, holding the radius to +.001", minus *nothing*. Finish, with an 80 grit wheel, is excellent. This is only one example of the variety of work other than flat grinding you can do at profit-boosting speed and precision on this versatile, high-powered grinder. Write for Bulletin "HP."





The No. 221 Production Disc Grinder, with 22"-24" wheel capacity, gives you faster, more accurate production of piston rings, coil springs, universal joint spiders, and similar parts. Write for Bulletin 647.

Grinds 2100 piston pins per hour.. with automatic hopper feed!

Removing .010" stock from both ends of steel piston pins, this Mattison No. 221 Double Spindle Disc Grinder finishes 2100 pieces per hour, holding length and squareness within .001". Pins from the hopper enter a stacking mechanism, from which they are picked up automatically by a rotating carrier plate and clamped in hardened "V's" for grinding. Sizing devices continuously gauge accuracy of the work and actuate the feed to compensate for wheel wear. Thus, non-productive machine time is minimized and only spot-checking of pieceparts for size and squareness is necessary.

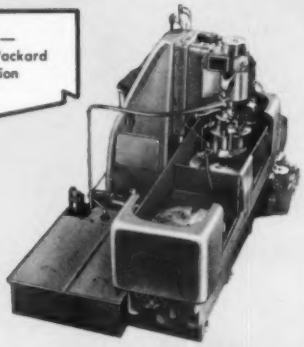
MATTISON
HIGH-POWER
GRINDING METHODS

Saves two milling operations...finish grinding difficult-to-machine castings to close tolerance!

Torque converter housings were formerly milled (two cuts per surface) and then finish ground to the required tolerance. Today, top and bottom surfaces are ground in one operation per side on a Mattison "Duplex Rotary" at the rate of 17.4 pieces per hour . . . removing .060″ to .070″ stock from each surface . . . holding all surfaces flat and parallel within .0015″. *One* operator and *one* machine easily do the work of two! The Mattison "Duplex" is powered and rigidly built for heavy, multiple-pass grinding of small- or medium-size pieceparts. For simple facing operations, it will give you increased production and greater accuracy at lower cost!

Open section made these castings difficult to mill without springing the ends. Two surfaces are now ground from the rough, holding required accuracy with ease. Two rotary tables eliminate nonproductive time ordinarily required for cleaning the chuck and loading the work on a single-table machine. Write for Bulletin No. 145.

Courtesy—
Studebaker-Packard
Corporation



SEND PARTS TO MATTISON METHODS LABORATORY FOR SAMPLE GRIND AND PRODUCTION ESTIMATE

The Mattison Methods Laboratory . . . equipped with all major types of modern surface grinders, face grinders, and disc grinders . . . introduces a new service to metalworking plants. You are invited to submit parts for sample grinds, production estimates, wheel recommendations, and other production requirements. Please include part prints, operation or route sheets, and all special requirements for machining your pieceparts. You'll get a comprehensive report based on close duplication of field conditions. With over 50 different grinders for production and toolroom work, Mattison can specify machines that meet your needs *precisely* . . . and give you maximum accuracy, productivity, and economy.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.

HIGH-POWERED SURFACE GRINDERS

MATTISON MACHINE WORKS
ROCKFORD, ILLINOIS

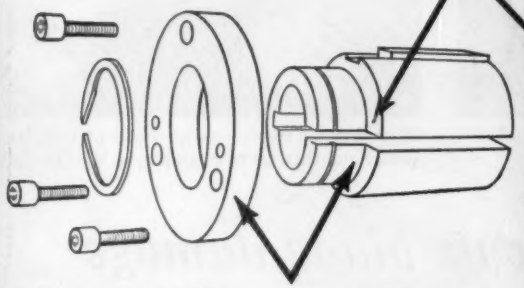
Get the ONLY SHEAVE with ALL these needed features

TEXROPE Sheaves with MAGIC-GRIP Bushings

Full-length bushing key for uniform torque transmission along entire bushing.

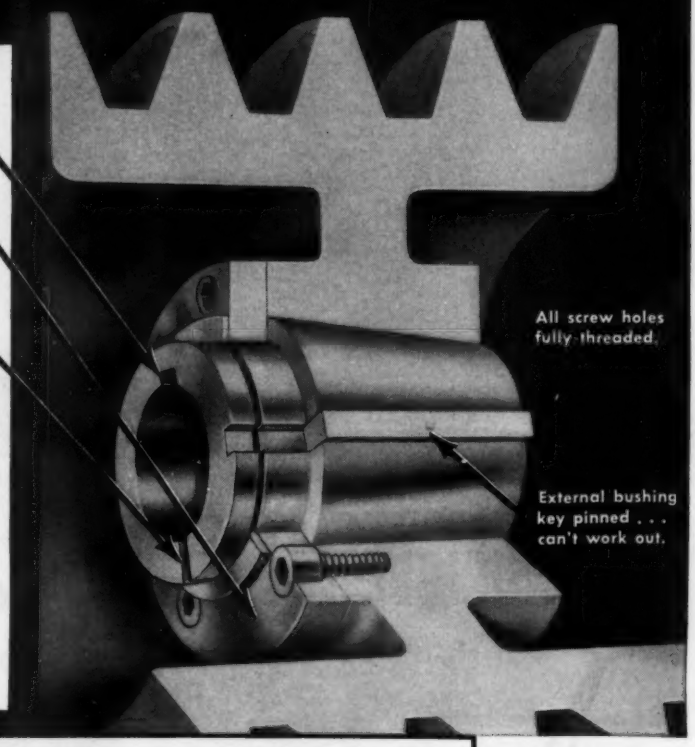
Floating collar allows cap screws to draw sheave on taper of bushing without binding — collar takes no torque.

Full-length split and uniform section provide uniform grip over entire contact surfaces.



No torque carried by screws as all torque is transmitted through keys.

Two-piece bushing (cast-iron sleeve and free-floating collar).



Here's Comparison of *Magic-Grip* Sheave and Other Sheaves

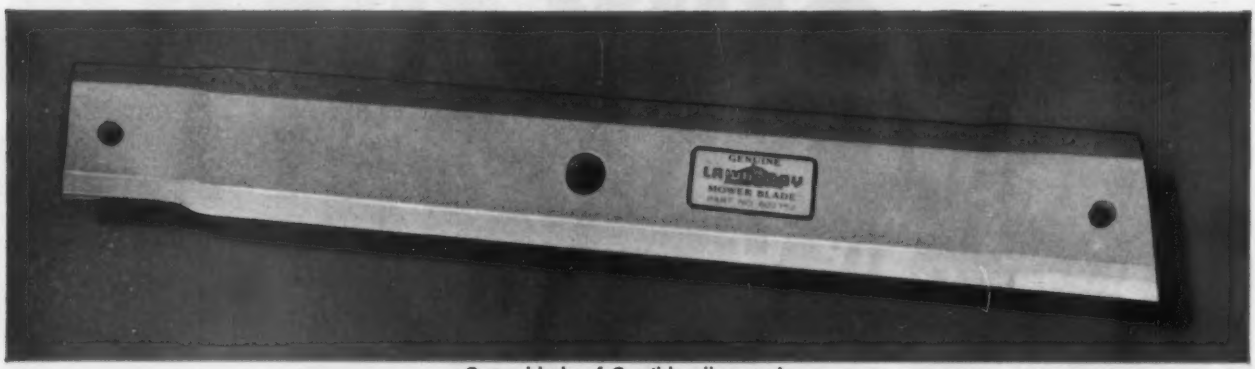
	Magic-Grip Sheave	Sheave A	Sheave B	Sheave C
Bushing fully split and uniform in section for full-length, full-circumference grip.	Yes	Yes	No	Yes
Torque carried by keys instead of threaded bolts.	Yes	No	No	No
All screws engage all threads fully.	Yes	Yes	Yes	No
Mounts in one piece.	Yes	No	Yes	Yes

See Your Allis-Chalmers District Office or Authorized Distributor

Texrope and *Magic-Grip* are Allis-Chalmers trademarks. A-4553

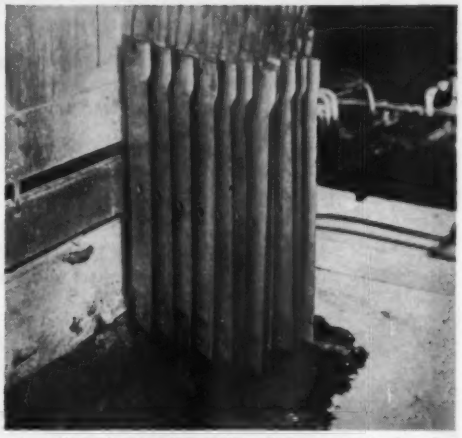
ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN



Cutter blade of Crucible alloy steel.

First step in manufacture of cutter blade. Crucible beveled blade alloy steel is fed through this 100-ton press, where it is cut to length and holes punched.



Next, lengths are formed to shape on a hydraulic press, and then given a tempering bath as shown.

CRUCIBLE ALLOY STEEL *cuts blade damage in rotary mowers . . .*

Lawn-Boy mower. Built by RPM Manufacturing Co., Lamar, Mo., a subsidiary of Outboard, Marine & Manufacturing Company, maker of Johnson & Evinrude outboard motors.

Rotary lawnmower cutter blades, whirling at high speeds, often hit small rocks or bits of trash. Ordinary steels just can't take that sort of rugged treatment. They chip, crack — wear out far too quickly. That's why in leading mowers, like the new *Lawn-Boy*, you'll find special *alloy* steel cutter blades *designed for reliable performance.*

For Crucible has developed a *special alloy steel* made to give the best possible combination of toughness and hardness for long-lasting edges—and formability and ductility for ease of manufacture. It's been so successful that *Crucible is now the largest producer of lawnmower steels.*

Most Crucible steels are designed to fill *special* needs. If you have an application where ordinary steels won't do, come to Crucible. Take advantage, too, of the dozens of technical booklets and data sheets Crucible has prepared to help you make the best use of special steels. For a free publication catalog, write *Crucible Steel Company of America, Henry W. Oliver Building, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Here's Your Best Assurance of

Higher Output Better Accuracy Reduced Costs

On Every Boring and Facing Operation . . . . .

TWO-CUTTER BLOCK WITH EXPANDABLE CUTTERS
MICROMETER-ADJUSTABLE SINGLE-CUTTER BLOCK
MULTI-CUTTER BLOCK WITH EXPANDABLE CUTTERS
SOLID BLOCK CUTTER

With only two items to handle — block and taper lock screw — it takes but a few seconds to insert a Davis block in its bar and start boring.

ONLY DAVIS GIVES YOU ALL 8 OF THESE ADVANTAGES

1. *Block centers accurately in bar.*
2. *Full thrust transmitted to bar.*
3. *Readily adjusts to float boring.*
4. *Cutters rigidly locked in block.*
5. *Assure maximum range of bore sizes.*
6. *Blocks feature built-in centers.*
7. *Fore or back bore with one tool.*
8. *Quick, easy changing of blocks.*

FOR COMPLETE INFORMATION, WRITE FOR DAVIS CATALOG 304

All 4 Block Styles Fit into the Same Bar Slot

Every boring job in your shop goes faster, more accurately and shows up far better on cost records when you standardize on Davis block tooling.

Truer bores result from exclusive design features and simplified, precision construction. The unique Davis double-piloted, taper lock screw is unequalled for accurate centering of block and transmission of full boring thrust to the bar slot. Rigidly supported and locked cutters assure higher accuracy on even heaviest cuts.

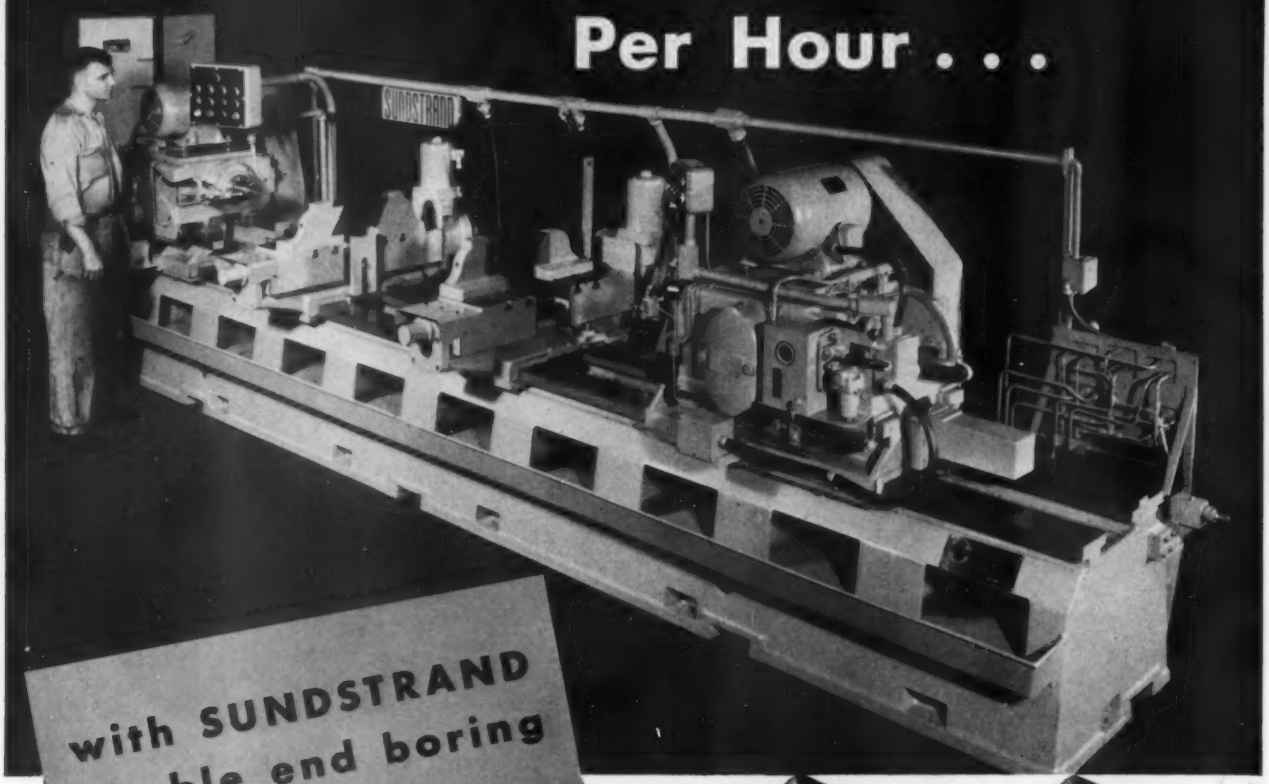
Faster, more economical boring results from the complete interchangeability of the Davis block line. Four basic block styles can be used in any particular bar slot—and changing blocks is simpler and faster than any other method. Bring your boring operations up to date—write now for complete information on how Davis Interchangeable Block Tooling can save you time, money and rejects.

DAVIS

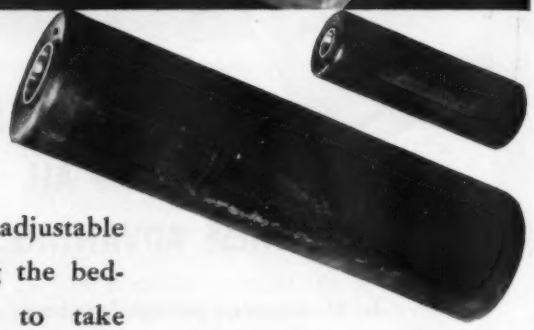
BORING TOOL DIVISION OF
Giddings & Lewis Machine Tool Co.
Fond du Lac, Wisconsin

THE ONE NAME THAT CERTIFIES ULTIMATE PRECISION AND PRODUCTIVITY IN TOOLING

Production Increased from 20 to 60 Pieces Per Hour . . .



with SUNDSTRAND double end boring machine



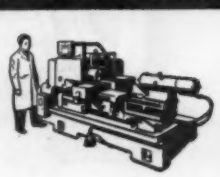
This Sundstrand Double End Boring Machine has been equipped with tooling to bore, face and chamfer conveyor rollers. Twenty-two sizes of rollers are machined varying from 4″ to 7″ in diameter, and from 6-11/32″ to 9′ 6″ in length. Both vises and the right hand head are adjustable along the bedways to take care of the varying lengths of parts. Both heads operate in an automatic cycle to bore at a preset depth, face and chamfer and rapid return.

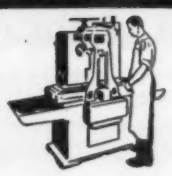
SUNDSTRAND

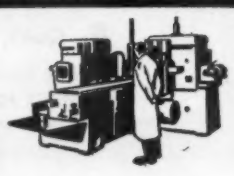
50 YEARS OF *"Engineered Production" Service**

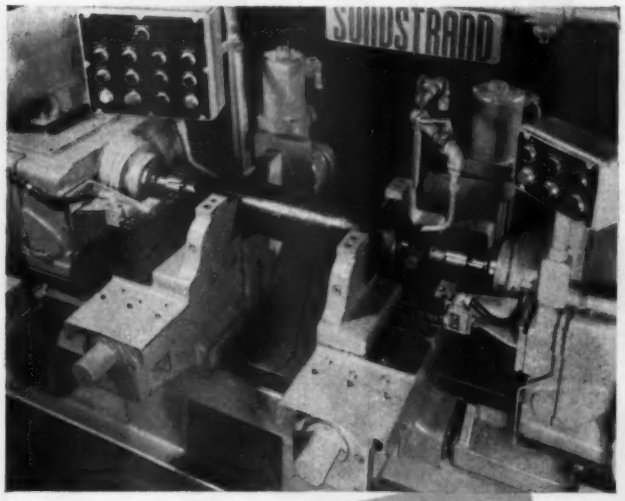
*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS









Tooling and job data

when you want Production at lowest cost use SUNDSTRAND "Engineered Production" Service

Rollers are of 1010 to 1020 steel and are machined in lot sizes varying from 50 to 3000 pieces. Tools used are of the combination boring, chamfering and spot facing type with carbide inserts. Shown above is a close-up of the tooling used on this double end boring machine. Parts are power clamped and machine is operated with push button controls.

This is only one of many productive installations that has resulted from Sundstrand "Engineered Production" analysis and service.

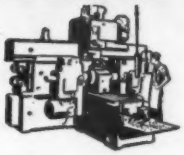
Basically, there are two approaches to solving metal working problems: (1) obtaining standard machines, then trying to process parts over these machines as economically as possible; (2) designing the most profitable processing method first, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, when necessary. The latter is the Sundstrand method.

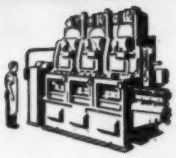
Additional data

on Sundstrand "Engineered Production" solutions are covered in these two bulletins. Write for your copies today. Ask for bulletins 156.

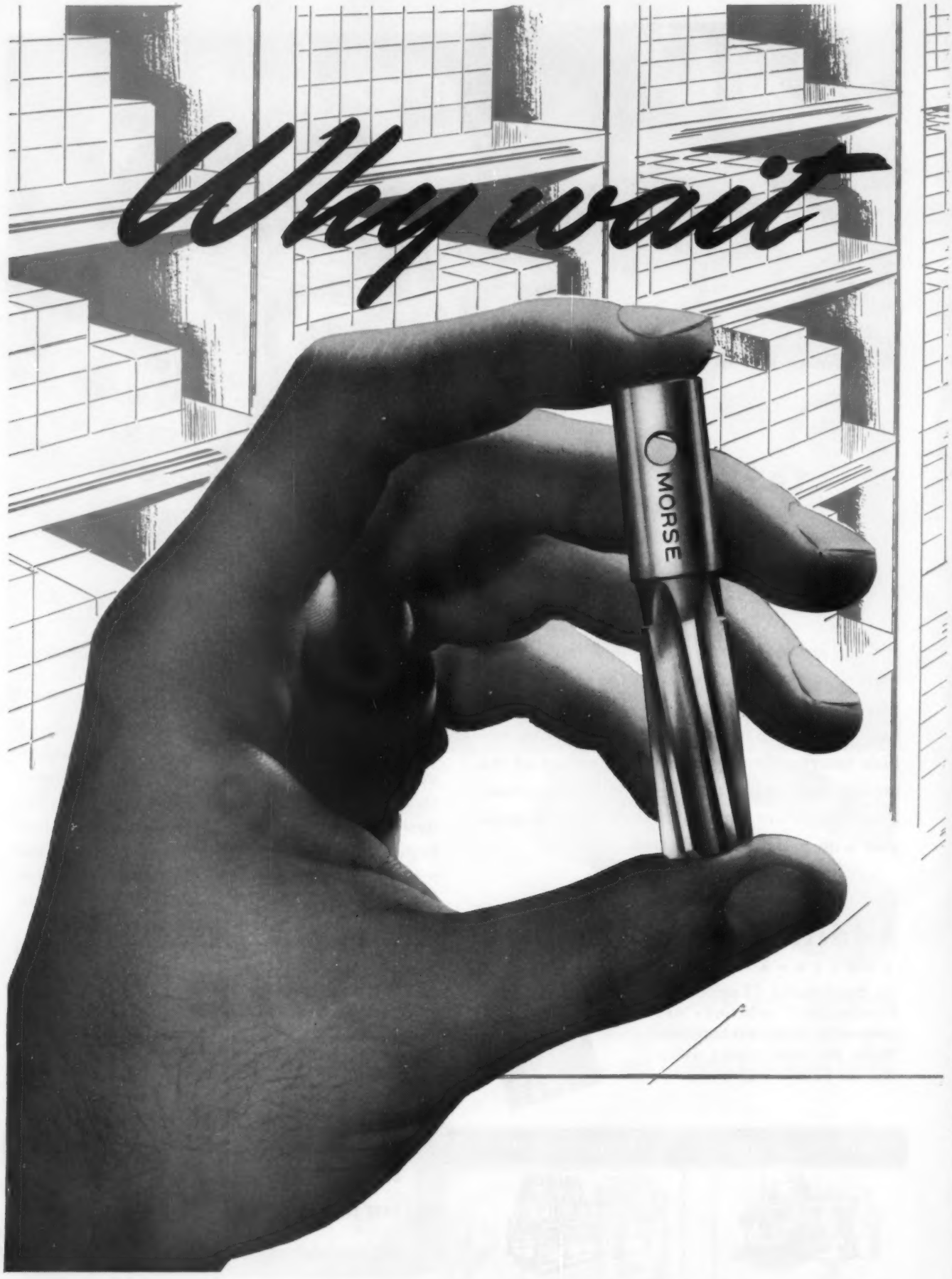
See Sundstrand machines in action in Booth No. 1412 at the Machine Tool Show, International Amphitheatre, Chicago, September 6-17, 1955.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.


Why wait
MORSE

'til tomorrow

for Screw Machine Reamers when MORSE can ship them TODAY?

That's right! Morse is set up to give you immediate delivery on Stub Screw Machine Reamers in any size ranging from .060″ through 1″. This is typical of the many services that your Morse Franchised Distributor can offer you on all your cutting tool needs. He's the only man that can offer you the many Morse exclusives including Electrolized tools and Vectormatic ground taps.

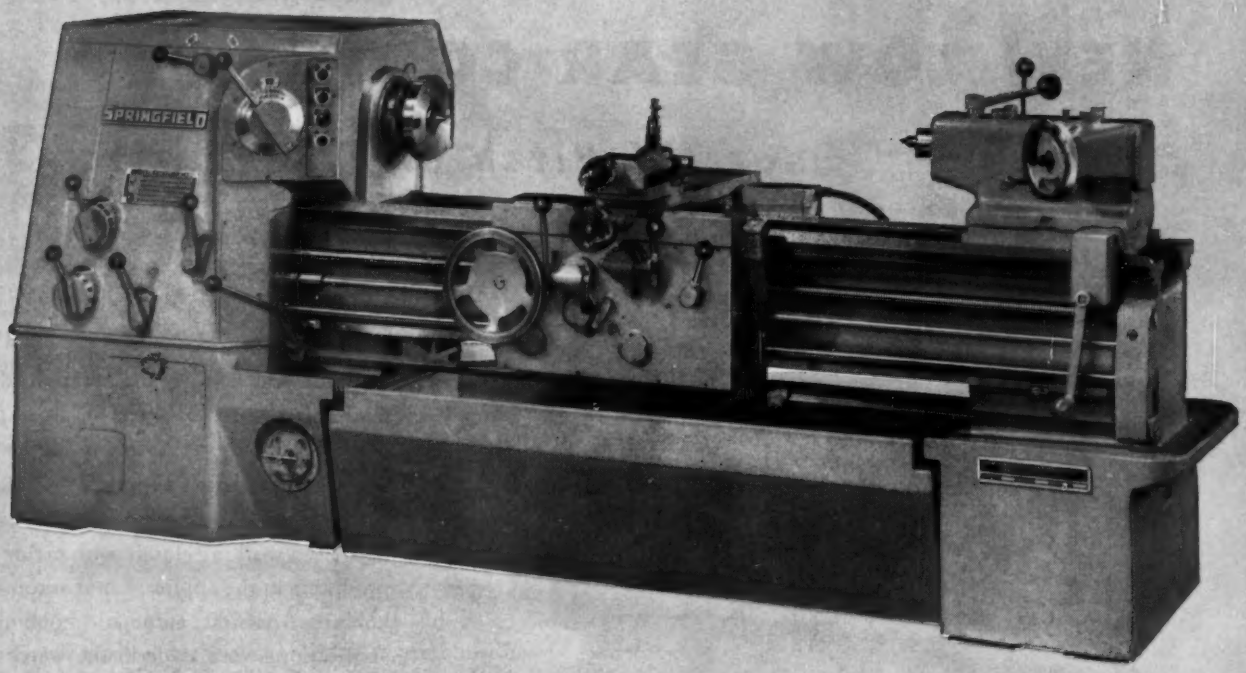
Your Morse Franchised Distributor is your only source of "production insurance" . . . he's got the know-how and the stock to start you toward better work and savings than you ever expected. *Call him today!* He'll give you your first saving (in time) right now.

THE MORSE CODE MEANS 100% DISTRIBUTOR PROTECTION . . . **on all**

MORSE
Cutting Tools

SPRINGFIELD

See Springfield at Booth 612, Machine Tool Show, Chicago, Sept. 6-17.



more useful horsepower

All the horsepower in a Springfield Model "S" Lathe is productive.
A simple, straight-forward gear train, plus double-action lubrication, plus tight dynamic balance tolerances (.0005" displacement) eliminate friction and vibration, the twin horsepower thieves.
In the headstock, only the gears necessary to a given speed are engaged. Other gears run free with a stabilizing flywheel action, no drag on power.
A high pressure filtered oil mist keeps all gears and bearings drenched, and a cascade of oil lubricates the feed box.

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".
Vertical Universal Grinders: swings 18" to 42".

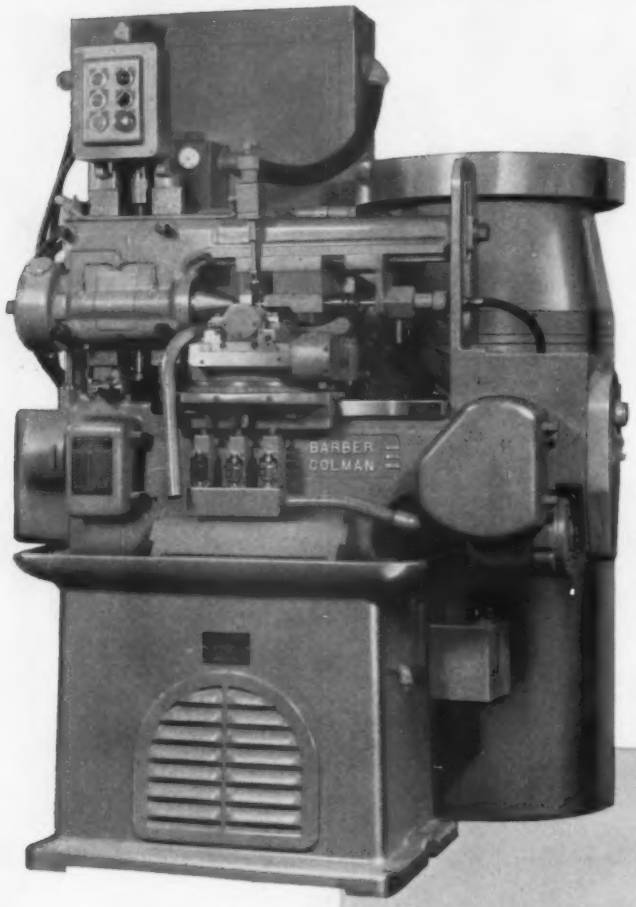
The Springfield Machine Tool Company
Springfield, Ohio
68TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

NEW LOW GEAR COSTS

Gears 16 Pitch or Finer...with

FULLY AUTOMATIC GEAR HOBBING



As more and more gear operations are modernized to place them on a competitive basis, automatic gear hobbing equipment becomes an essential approach in reducing gear costs. Since 1937 Barber-Colman engineers have been working closely with major gear producers in the application of automatic gear hobbing. At first, automatic hobbing applications were made in the watch gear and instrument fields. Later, machines were built for medium pitches in other fields, such as fishing reel gears. The latest Automatic No. 6-10 Hobbing Machines are designed specially for cutting automatic transmission and speedometer gears to meet the required rate of production on an automatic production line.

First Automatic Cycle Hobbing Machine 1936.
First Fully Automatic Hobbing Machine 1937.
Automatic Hob Shifting for Increased Tool Life 1944.

B U I L D E R S O F P R E C I S I O N G E A R

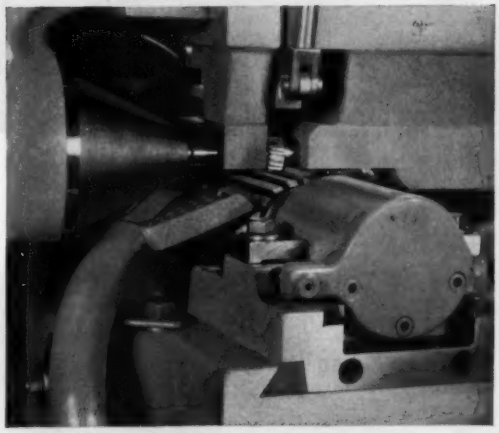
HIGH-PRODUCTION PLANT REPORTS SAVINGS IN UNIT-COSTS WITH FEWER GEAR REJECTS

In this particular production plant, fewer gear rejects are occurring. An overall reduction in cost per gear has been effected through reduced man-hours and continuous high-speed output. One of a battery of machines performs as follows:

Automatic Cycle — 356 Hob RPM, .030" feed per rev., 34-second complete cycle time, 1 per load.

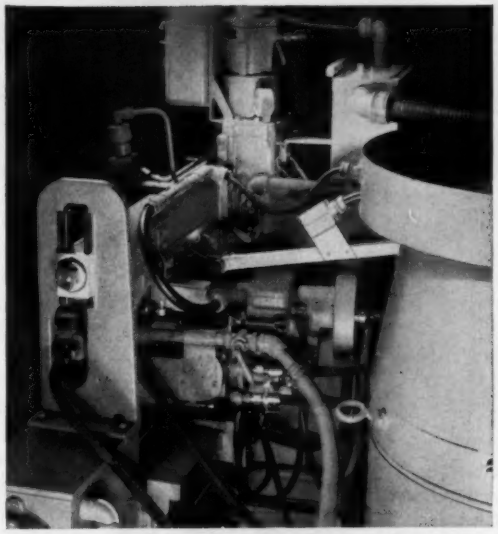
Speedometer Gear — 19 teeth, 8°3'22" RH helix angle, 26 DP, .850"OD x 3/8", 25°PA.

Class C Accurate Unground Hob — 2 3/8"OD x 3" face x 3/4" bore, 3-thread, 25°PA, 4200 pieces per sharpening.



COMPLETELY AUTOMATIC CYCLE PROVIDES CONTINUOUS HIGH-SPEED GEAR CUTTING

Blanks are automatically loaded through a hopper-feed system and positively located and clamped on a solid arbor in cutting position. The cycle sequence includes rapid traverse to the hobbing position, lowering of the work slide to cutting depth, hobbing the blank, raising the work slide, rapid traverse to the right, and unload. A new blank then is automatically presented for hobbing and the cycle repeated continuously until the machine is shut off. The machine is equipped with an automatic hob shifter which moves the hob to a new cutting position after each cycle.



ADAPTABLE TO WIDE RANGE OF LONG-RUN, HIGH SPEED GEAR PRODUCTION

This type of cycle arrangement is adaptable to many similar long-run gear cutting operations within the general range of 16 pitch and finer, depending upon the particular gear specifications. The cycle is arranged to suit the requirements of the job, and tooling, feed, speed and cycle-timing will depend upon the required production and gear specifications.

ENGINEERING SERVICE AVAILABLE WITHOUT OBLIGATION

Check your high production gear operations to determine whether you are maintaining a competitive cost basis. Barber-Colman engineers will gladly consult with your gear production people to demonstrate the cost-saving benefits of automatic hobbing. Ask your Barber-Colman representative to arrange an appointment for you, or write directly to Automatic Hobbing Engineering. No obligation.

HOBS • CUTTERS • REAMERS
HOBBING MACHINES
HOB SHARPENING MACHINES

BARBER COLMAN

Barber-Colman Company

GENERAL OFFICES AND PLANT, 616 ROCK STREET, ROCKFORD, ILL.

HOBS AND MACHINES SINCE 1911

BUTTERFIELD

A COMPLETE LINE OF QUALITY cutting tools is now available from your Butterfield distributor. Taps are made to the same exacting standards as Butterfield Milling Cutters, Dies, Drills, Reamers, Counterbores and End mills.

UNION TWIST DRILL COMPANY

BUTTERFIELD DIVISION

DERBY LINE, VERMONT, U. S. A.

FOR FAST, ECONOMICAL SERVICE
CALL YOUR **BUTTERFIELD**
DISTRIBUTOR

Late shipments, late shipments, they always came late!
Delays were unbalancing Jack's mental state . . .

Then, just in time, he discovered this cure
RAILWAY EXPRESS ships things swift, safe, and sure!

The big difference is

Whether you're sending or receiving, whether your shipment is big or small, and whether it's moving by rail or air—you'll find it pays to specify Railway Express. It makes the big difference in speed, economy, and safe, sure delivery.

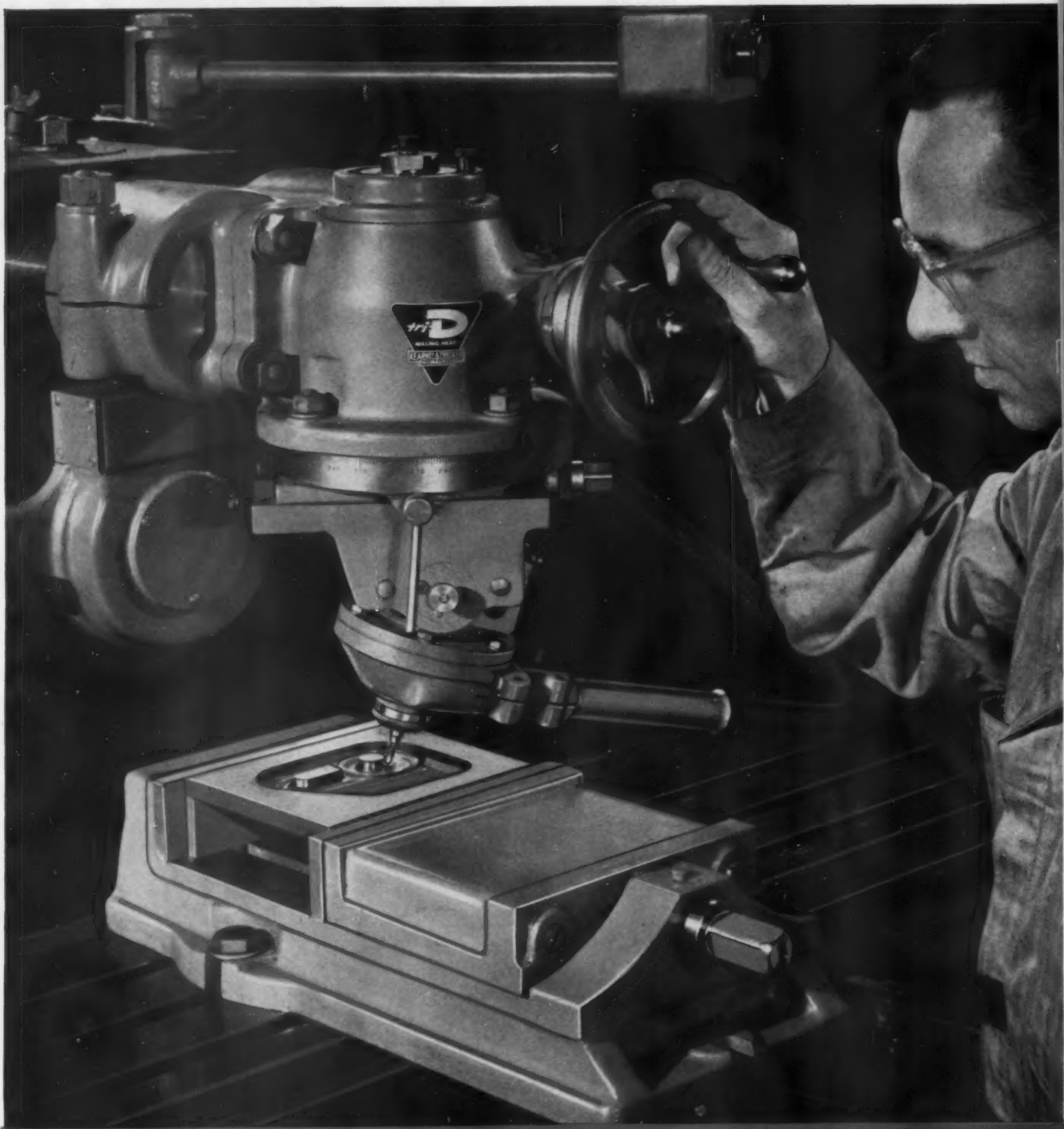
• • •

To bring you even better service, Railway Express has just invested 9½ million dollars in 3,000 new, high-efficiency trucks. It's another example of how free enterprise, like Railway Express, constantly works to serve the public best.

RAILWAY EXPRESS AGENCY

. . . safe, swift, sure

Mill circles and angles in



Angular adjustment of cutter in the vertical plane is an exclusive feature of the TRI-D Milling Head. Here, operator performs finish milling on intricate workpiece requiring straight, circular, angular and radii milling . . . *all in a single set-up.*

This job and many others are featured in a 20-minute sound color film, "The Little Showoff." Write on your company stationery for reservation.

Builders of Precision and Production Machine Tools Since 1898

one set-up with

For tool rooms, die shops or production milling—do it faster, easier with new TRI-D Head

Kearney & Trecker's new TRI-D Milling Head — featuring rotary movement, lateral and angular adjustment in vertical plane — measurably cuts production milling costs . . . eliminates multiple set-ups . . . produces more in less time. As illustrated, the TRI-D attachment is ideally suited for rough and finish milling of various geometric shapes—straight lines, radii, circles, angles — all in a single set-up. What's more, it's adaptable for quick and easy mounting on almost all horizontal and some vertical milling machines . . . *regardless of make.*

Learn what TRI-D can do for you—how different it is from all other types of milling heads. Your Kearney & Trecker representative will be glad to arrange a "proof-positive" demonstration without any obligation. Contact him today, or write Kearney & Trecker Corporation, 6784 W. National Avenue, Milwaukee 14, Wisconsin.

tri-D® MILLING HEAD
KEARNEY & TRECKER MILWAUKEE

Pat. No. 2286821
Other Pat. Pend.

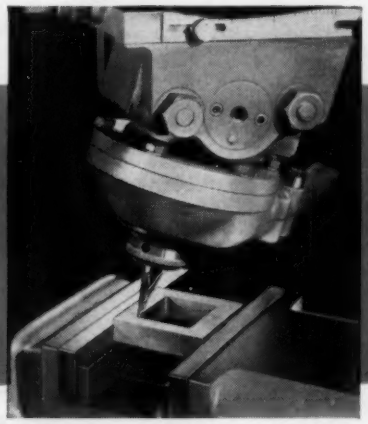
BOOTH NO. 508

THE MACHINE TOOL SHOW
CHICAGO, ILL.
INTERNATIONAL AMPHITHEATRE

Kearney & Trecker will display, and have in operation, its latest machine tools. More than 25 standard and production machines, including attachments and accessories, will be exhibited. Be sure to visit Booth No. 508.

Die (left) and punch (right) are rough and finish milled in a single set-up, using all three basic movements of the TRI-D and universal milling machine. Table is swiveled for milling straight side of both workpieces. Table movement is

used to mill the long straight side. TRI-D is rotated. Saddle feed is engaged to mill short straight side. At tangent of next radii, saddle feed is disengaged and entire procedure repeated. Clearance angle in die is milled using same dimensions.

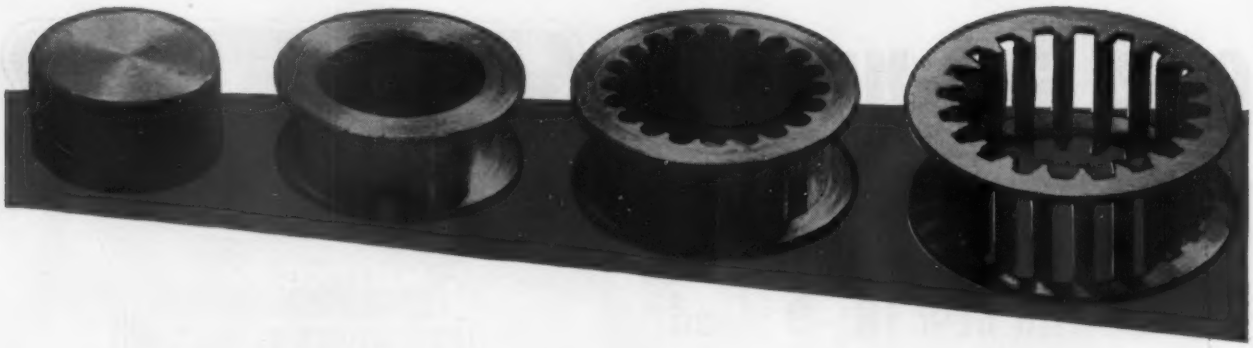


TRI-D Head, with an ordinary end-mill ground to a specific angle, is used to finish a "square corner." Adjustment of TRI-D Head and swivel block to prescribed setting and vertical feed of the milling machine is required to do the job.

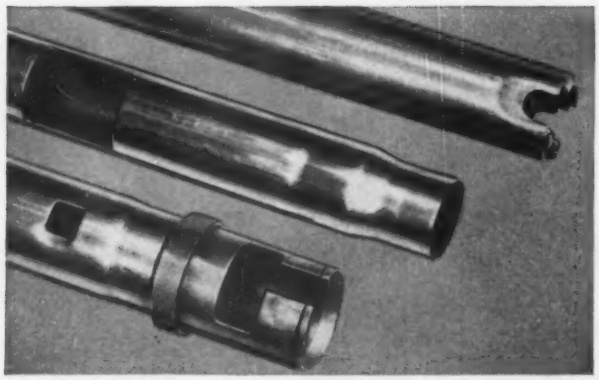
Kearney & Trecker
CORPORATION
MILWAUKEE 14, WISCONSIN

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

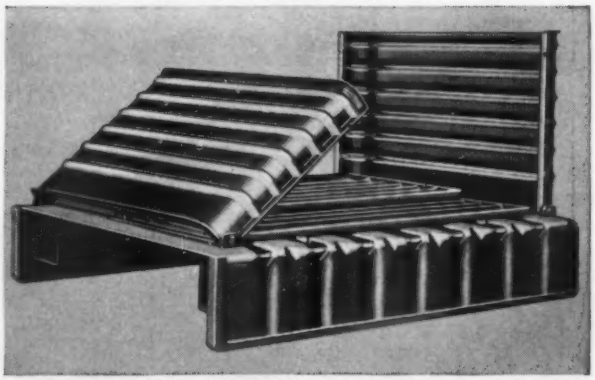
For more information on Kearney & Trecker's new TRI-D Milling Head, write for catalog No. TD-10.



Republic Alloy Steels help Johnson make dependable



YOU CAN SAVE ON TUBULAR PARTS LIKE THESE when Republic does the tube fabricating. Republic's Steel and Tubes Division is equipped to handle all kinds of tough fabricating jobs—has the machinery, the experience and the ability to work out the most economical method of making quality tubular parts. And that includes complete assemblies.



SAVE UP TO 66% OF YOUR STORAGE SPACE with Republic Collapsible Boxes. This PB-127 unit solves the problem of storing and shipping empty boxes. It's designed for heavy-duty service. Can be tiered when loaded or empty—collapsed or set up. It is a one-piece unit. Pin and slide belt arrangement assures positive locking.

REPUBLIC STEEL CORPORATION
3102 East 45th Street
Cleveland 27, Ohio

REPUBLIC STEEL

Please send more information on:

☐ Cold Drawn Alloy Bars ☐ Boxes and Skids
☐ Mechanical Tubing ☐ Free-Machining ENDURO®

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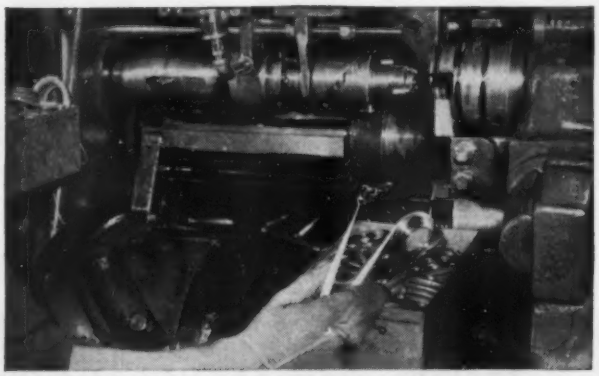
K-8878



GIVE YOUR DUPLICATE PARTS THE HIGH MECHANICAL and corrosion-resisting properties of stainless steel. Do it without a heavy production penalty. Simply set up and run Free-Machining ENDURO Stainless Steel Bars. Two grades are fully 90% as machinable as Bessemer screw stock. These high-quality, cold drawn bars provide close tolerance, accuracy of section, uniform soundness, a fine surface finish. Available in hot-rolled bars as well as cold finished bars and wire.

outboard motors

The combination of engineering know-how and use of only the highest quality materials, including Republic Cold Drawn Alloy Steels, provides the key to the built-in dependability of Johnson Sea-Horse Motors.

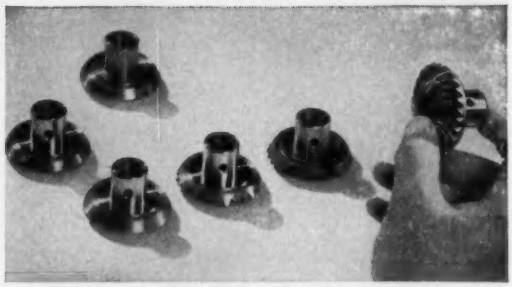
Highly machined parts, such as the connecting rod bearing retainer shown above and the spiral bevel gears that drive the propeller shaft and other parts, are made from Republic Cold Drawn Alloy Steels.

As in many new product developments, certain difficulties were encountered in the initial stages of production. The bearing retainer, considered to be one of the most difficult parts in existence to machine, is a case in point.

During rough broaching, chips welded to the broach and tearing of the metal occurred on bearing pockets. A Republic Field Service Specialist was invited to work on this problem with Johnson Engineers. A solution was worked out through close cooperation and teamwork. The blanked parts were heat-treated to increase Brinell hardness. Broaching improved immediately. Chip adherence was eliminated. Surfaces were much smoother.

Republic supplies Johnson with cold drawn alloy steel bars for better machinability, longer tool life and the fine finish needed for parts on their new line of quiet motors.

You can put these qualities of Republic Cold Drawn Alloy Bars to work in your steel parts—plus high strength, close tolerance, toughness, hardenability, accuracy of section. And Republic metallurgists and machining specialists stand ready to help you uncover the answers to tough cost and production problems, ready to help you get the most out of the Republic Cold Drawn Alloy Bars you buy. The coupon will bring you more information.



Gear action on Johnson Motors is smooth, positive, quiet. Photo illustrates sequence of machining operations performed on the spiral bevel gears that drive the propeller shaft. Republic Cold Drawn Alloy Steels give these parts added strength and a fine surface finish.

REPUBLIC STEEL

World's Widest Range

of Standard Steels and Steel Products

C-O-MATIC

NOW! Weld even mild and

announced by A. O. Smith

medium carbon steels automatically...

new gas-shielded metal arc process uses Carbon Dioxide to shield the arc

ON GAS ALONE **in one year's time (3 shifts per day, 260 days), a single C-OMATIC unit saves you *$14,902.00 over Argon, $15,367.00 over Helium.***

● **NEW ECONOMY** thanks to use of less-costly Carbon Dioxide . . . thanks to low maintenance requirements of functional design.

● **X-RAY QUALITY WELDS** — Strength and ductility — yours with C-OMATIC.

● **VISIBLE ARC** means faster, easier welding . . . quick, convenient spotting of nozzle. (When required, C-OMATIC is easily convertible to submerged arc, too.)

● **DEEP PENETRATION** further assures high quality welds. No slag to remove . . . no flux to clean up.

● **ACCURATE CONTROL SYSTEM** of constant current design maintains preset arc voltage without fluctuation. No complex electronic circuits! Auxiliary controls available.

● **POWER SOURCE** — The service-proved A. O. Smith d-c rectifier.

Chart illustrates astonishing savings

	HELIUM	C-OMATIC	YOUR SAVINGS		ARGON	C-OMATIC	YOUR SAVINGS
Gas consumption per hour	70 cu. ft.	30 cu. ft.	40 cu. ft.	Gas consumption per hour	60 cu. ft.	30 cu. ft.	30 cu. ft.
Cost of gas per cu. ft.	$0.067	$0.01	$0.057	Cost of gas per cu. ft.	$0.09	$0.01	$0.08
Cost of gas per hour	$4.69	$0.30	$4.39	Cost of gas per hour	$5.40	$0.30	$5.10
Cost per hour 60% of duty cycle	$2.81	$0.18	$2.63	Cost per hour 50% of duty cycle	$2.70	$0.15	$2.55
Cost per day (3 shifts, 22.5 hours)	$63.20	$4.05	$59.15	Cost per day (3 shifts, 22.5 hours)	$60.80	$3.38	$57.42
Cost per year (260 days)	$16,420	$1,053	**$15,367**	Cost per year (260 days)	$15,780	$878	**$14,902**

GET ALL THE FACTS NOW! Write for free booklet describing C-OMATIC in detail. Welding Products Division, A. O. Smith Corporation, Milwaukee 1, Wisconsin.

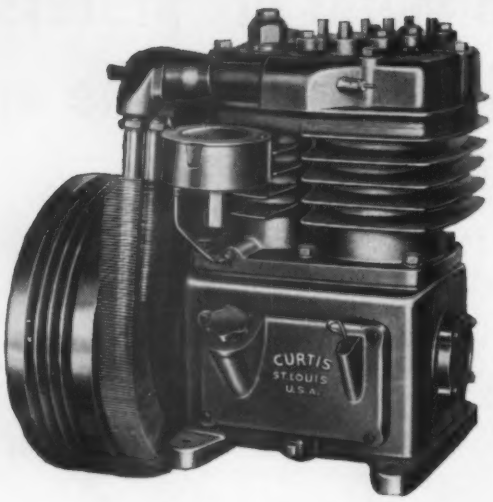
See C-OMATIC in action at the AWS show in Kansas City, Mo. . . . June 8 to 10 . . . Booth 256.

Through research A.O. Smith *. . . a better way*

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
INTERNATIONAL DIVISION: MILWAUKEE 1, WIS.

Cut your costs with *Curtis*

AIR COMPRESSORS
AIR HOISTS
AIR CYLINDERS



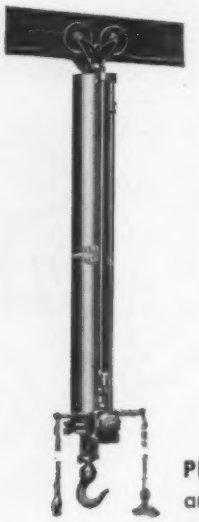
A plentiful supply

of air to speed production throughout your plant is assured with powerful, precision-built *Curtis* Air Compressors.

- **air-cooled, two stage—¼ to 20 H.P. inclusive**
- **water-cooled, single stage—20 to 50 H.P. inclusive**
- **Timken tapered main bearings permit easy external adjustment**
- **long-life pressure-lubricated connecting rod and piston pin bearings**

Tank-mounted compressors in sizes from ¼ through 15 H.P. inclusive (1 to 78 cu. ft.)—also available in base-mounted type.

Simple and base-mounted compressors from ¼ through 50 H.P. inclusive (1 to 300 cu. ft.).

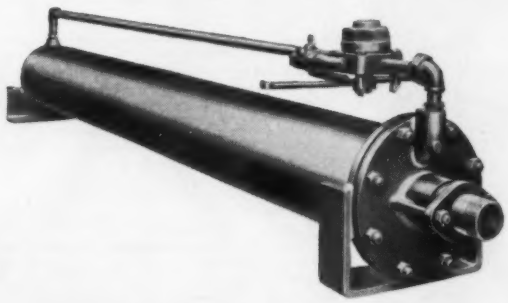


LIFT, LOWER, PUSH or PULL

easily, economically and safely with *Curtis* Air Hoists and Cylinders . . . capacities up to 10 tons.

- **lower initial cost**
- **lower maintenance costs**
- **smooth operation and precision control**
- **self-closing, rotary disc self-grinding valves**

PENDANT AIR HOISTS . . . ideal for any lifting or lowering operation.



BRACKETED AIR CYLINDERS . . . can be mounted horizontally or vertically for lifting, lowering, pushing or pulling.

FOR COMPLETE INFORMATION ON THIS CURTIS COST-SAVING EQUIPMENT . . . WRITE TODAY!

CURTIS PNEUMATIC MACHINERY DIVISION
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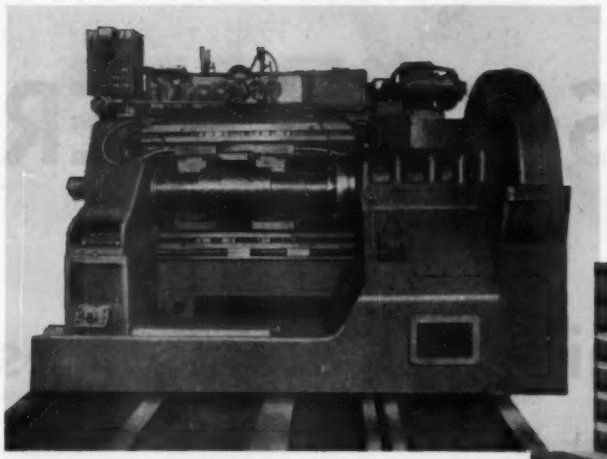
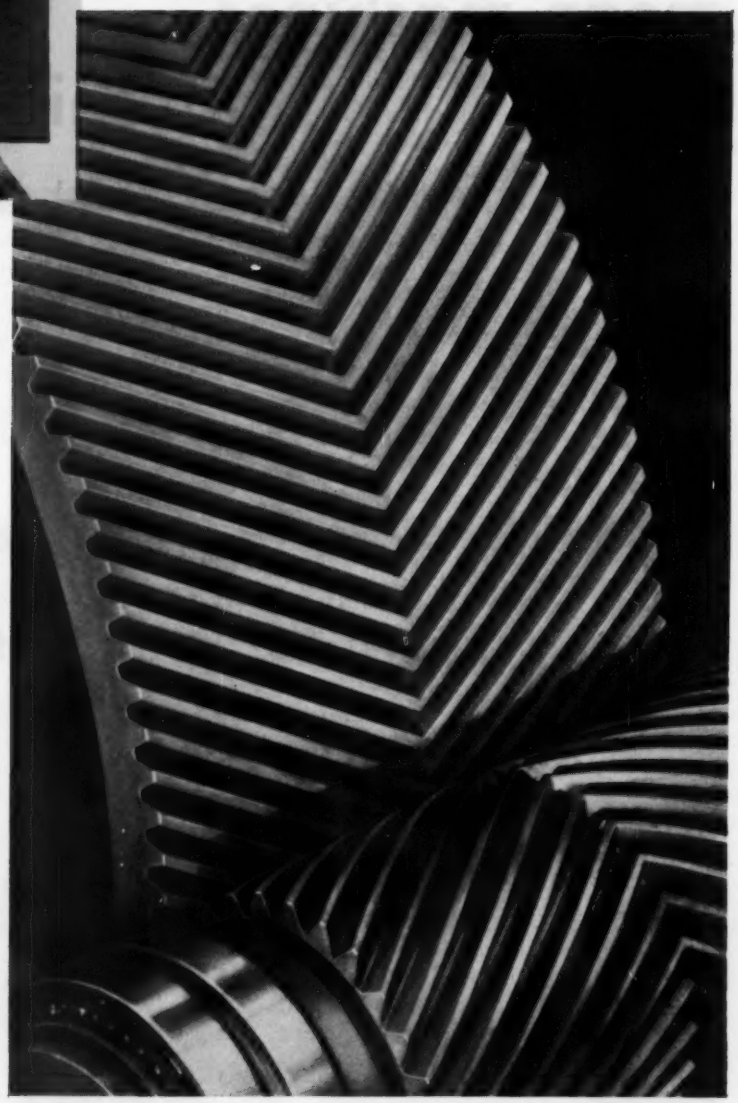
OTHER CURTIS PRODUCTS: Automotive Lifts and High Pressure Car Washers; Commercial and Home Air Conditioning

How to cut...



harder working gears



The Farrel-Sykes "Twin-Head" gear generator generates the two helices of a continuous-tooth herringbone gear simultaneously — without a center groove. Because there is no groove in the center, the entire face width of the gear performs useful work, providing extra strength and greater load-carrying capacity.

At the same time, the generator gives the gears extremely accurate tooth spacing, profile and helix angle. This pays off in smooth, quiet gear performance and prolonged gear life.

The "Twin-Head" generator also gives you versatility, high production and convenient operation. It makes fast, simple work of cutting every type of herringbone gear, single helical and spur gears, two members of a cluster gear at the same time, and other toothed and cylindrical forms.

Write for details of this accurate, versatile gear machine.

FARREL-BIRMINGHAM COMPANY, INC.
ANSONIA, CONNECTICUT

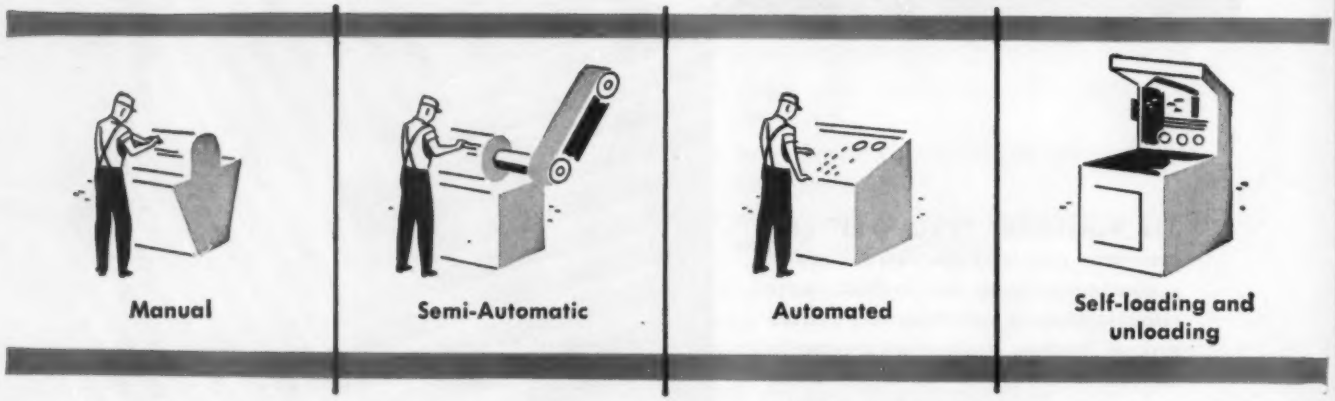
Plants: Ansonia and Derby, Conn., Buffalo and Rochester, N. Y.

Sales Offices: Ansonia, Buffalo, New York, Cambridge (Mass.), Akron, Cleveland, Chicago, Los Angeles, Houston.

FB-1006

Farrel-Birmingham®

THIS *Airborne Instruments* and LEES-BRADNER mean machines... that think for themselves



Down the years with machine tools

Lees-Bradner moves still further ahead in automatic gear hobbing: From Lees-Bradner self-loading and Lees-Bradner self-unloading to the newest development . . . AUTOMOTION.

In simple terms, AUTOMOTION employs an electronic checker that measures the accuracy of the gears as they come from the hobber. It works like this: As the finished gears run through the checker they are electrically measured for the desired root fillet and pitch diameter. If a gear coming off the machine does not measure up, an electronic impulse automatically corrects the pitch diameter and/or root fillet and shifts the hob as necessary *without stopping the machine!* This adjustment is made between cycles—not while the hobbing process is going on.

Details on the operation of the electronic checker are explained by Airborne Instruments Laboratory on the adjoining page.

Again, Lees-Bradner leads the hobbing parade with a revolutionary new development. Your Lees-Bradner representative can give you all the details, or you are invited to get in touch with us direct.

the LEES-BRADNER Company

CLEVELAND 11, OHIO • U.S.A.

Laboratory BRAIN

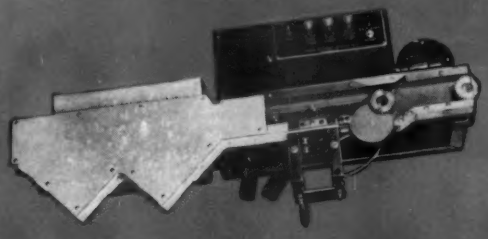
AUTOMOTION

The Airborne Instruments Laboratory Automatic Gear Checker means a new era of production history for gear manufacturing. Greater output in less time and at lower costs . . . reduction of machine shut-down for readjustment . . . longer machine life . . . all these will now become realities.

Essentially, however, AIL's electronic checker, developed for use with Lees-Bradner hobbing machines, enables these units to perform their own inspections . . . makes them compensate for inaccuracies while in operation. Equally important, it accomplishes, electrically, the shifting of hobs at the exact instant cutting edges begin to show wear, giving gear production the benefit of maximum hob life without deterioration.

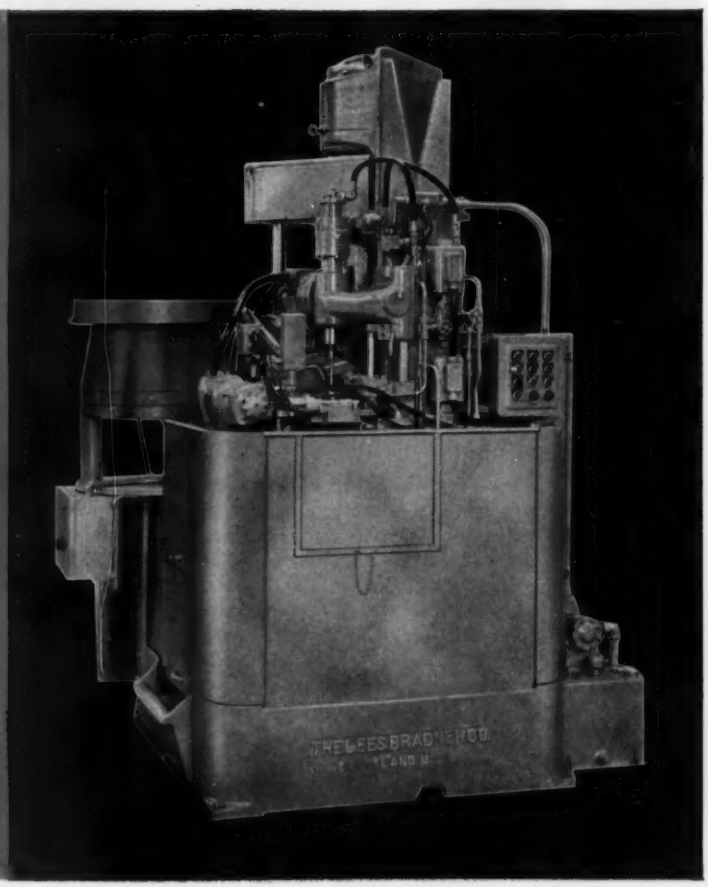
Furnishing gear hobbers with the power to think is but one of the many industrial advancements made possible by automatic control devices from Airborne Instruments Laboratory.

Write for complete details or contact your local AIL Sales Representative.



AIRBORNE INSTRUMENTS LABORATORY, INC.

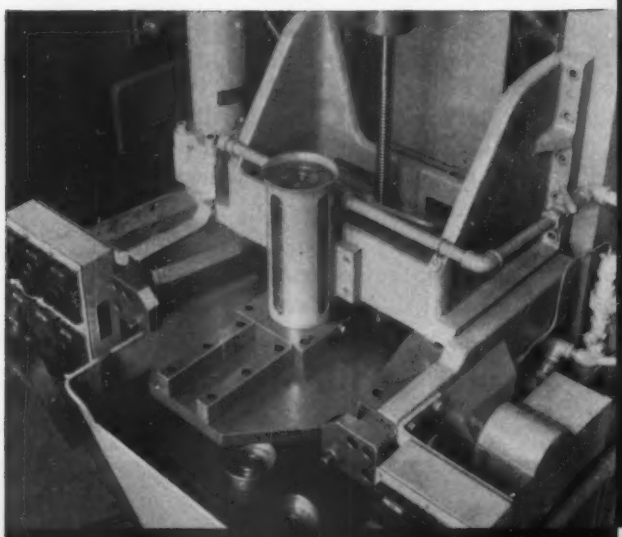
160 OLD COUNTRY ROAD
MINEOLA, N. Y.

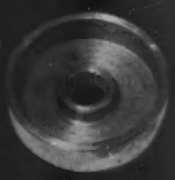


automatic broaching can be low cost broaching the *American* way

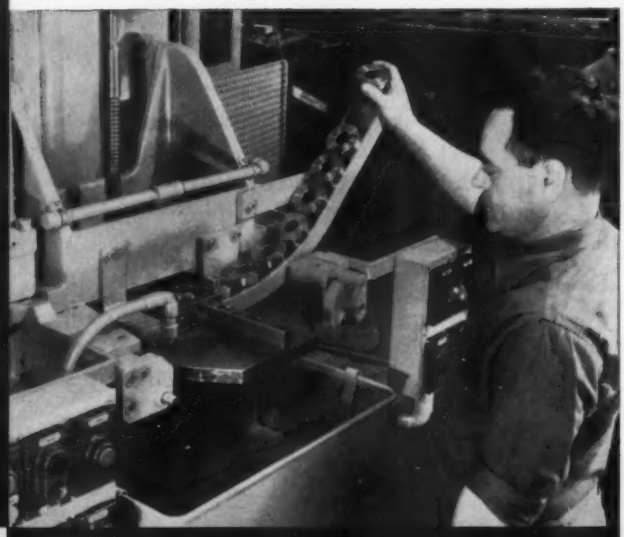
The broaching operation can justify automatic set-ups on smaller volume jobs when the tooling is kept relatively simple and the cost low. Illustrated here are two American machines which feature:

1. **Automatic cycle**
2. **Simple tooling**
3. **Magazine or chute feed**





This American vertical pull-up (VP) machine broaches the hub and spline of an automotive clutch hub. A hydraulic slide interlocked to the automatic machine cycle shuttles parts from the tube magazine into broaching position. The parts are broached and then ejected below. The slide automatically moves back during the broaching stroke and reloads a part. Production is over 300 parts per hour.



Here an American VP broaches the I.D. of a sun gear converter part for an automotive transmission. The inclined gravity chute feeds parts into the positioning fixture on the hydraulic slide. Production is over 300 parts per hour. Both machines will run continuously on automatic cycle. The operator only has to keep the magazines filled with parts.

Why not let American help you solve your broaching problems. Just send a blueprint or sample for a free estimate. American makes a complete line of broaches, broaching machines and fixtures. For further information on American VP internal broaching write for Catalog No. 401.

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

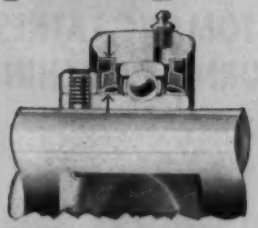
SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

Next time you're bearing comparing . . .

look for these

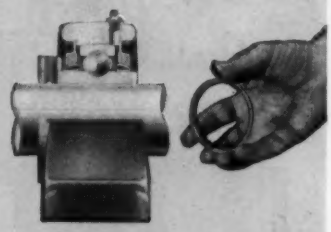
important differences



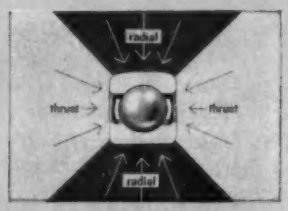
POSITIVE PROTECTION from moisture, dust and dirt is accomplished by seals extending from housing to inner ring. All aligning surfaces are enclosed in lubricant chamber.

Series 200 Ball Bearing Pillow Blocks are part of industry's most complete line of ball and roller bearing blocks.

AUTOMATIC RELIEF OF EXCESS GREASE PRESSURE. Patented revolving inner seal members have escape holes enabling excess lubricant to pass out through opening around periphery of seal. No danger of seal being forced out . . . no chance for high pressure to damage bearing.



HIGHEST CAPACITY obtainable to carry heavy radial, thrust or combination loads is provided by single-row, deep-groove design.



GREATER STRENGTH. Base of block is cored to provide uniform metal thickness, assuring a sound casting, free from distortion.

They're all present only in LINK-BELT ball bearings

THESE important bearing differences show up in the performance of your equipment. For instance, a bearing may be subjected to shaft misalignment throughout its working life. Link-Belt's lubricated self-aligning feature assures free rolling . . . maintains maximum efficiency under any service condition. And Link-Belt alone offers that advantage in both ball and roller bearing blocks.

Whatever your bearing requirements, look to Link-Belt. All types and sizes of Link-Belt bearings are available from stock. Ask your Link-Belt office or authorized stock carrying distributor for Data Book 2550, containing complete information on the entire Link-Belt line.

LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 13,714-A

MAINTAIN the EFFICIENCY
of your
AUTOMATIC LATHES
and TURNING MACHINES
with the
OLIVER
20" TEMPLATE (controlled)
TOOL BIT GRINDER

The instant you equip your toolroom with an efficient Oliver, grinding time will be sharply reduced . . . . production immediately expedited.

The Oliver method of single point tool sharpening utilizes a controlled and numbered template . . . grinds the complete tool in a single operation on one machine. The simple-to-operate 20" Template Tool Bit Grinding machine grinds single point tools in a fraction of the time required by other methods . . . reduces grinding time on tough tungsten-carbide work as much as 100% to 500% (using a notched wheel, with water on the wheel and through the wheel, makes this possible). Where quantities of precision-ground duplicates are required, the Oliver Way is the BEST!

Single point cutting tools machine ground on an OLIVER TOOL BIT GRINDER provide lasting accuracy *essential* to the efficient operation of automatic lathes and turning machines. Ground on an Oliver, single point tools have a fine finish . . . meet top standards without requiring the usual second operation of diamond-grinding. An OLIVER 20" TEMPLATE TOOL BIT GRINDER is a small investment for your toolroom that is sure to pay large dividends.

We'll be glad to tell you more—just write, wire or phone.

OLIVER INSTRUMENT CO.
1414 E. MAUMEE • ADRIAN, MICHIGAN

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

A Bow to GE

Your description of General Electric's Building 85 did not tell much about what goes on there. But Mr Vea's remarks should have been printed in big red letters in the front of your magazine. His statement that new GE products have created 45,000 new jobs since 1945, and that one person in five owes his job to products GE did not make nine years ago is the most powerful argument in favor of mechanization that I have ever heard.

John R Tucker
Wichita, Kansas

Ceramic Hogwash

Yes, I read it, too, but I wasn't able to take your lighthearted view (AM—Mar 28 '55, p153). I have every respect for the freedom of the press, but when newspapers distort facts, as they did in their ceramic cutting tool story, it is time a stop was put to it. I am not proposing censorship, but it might be a good idea if they were required to check for accuracy before publishing technical articles. In most cases, a telephone call would be enough to get the truth.

For my part I am sick and tired of reading the inaccuracies or deliberate falsehoods published by reputable newspapers. Let them stick to general news and leave technical matters to those who, like yourselves, are properly qualified to evaluate and report technical matters.

Wm H Butterfield
Cleveland

Foggy

Your article on the possible dangers of mist cooling (AM—Mar 28, '55, p122) was quite interesting but, as you say, completely inconclusive. I trust the coolant manufacturers and equipment manufacturers will get together as soon as possible and let us have some positive information on the matter. And I hope to be able to read it in AM.

There is no doubt as to the tremendous benefits to be obtained by mist

GRINETICS

By D G SMITH

FAN BELT

GRINDING OPERATION

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at Mason-Neilan . . . precision holes for

PRESSURE REGULATORS
CONTROL VALVES
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INSTRUMENTS

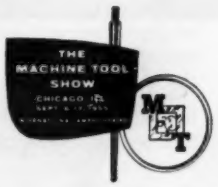
QUICKLY AND ECONOMICALLY PRODUCED BY

LELAND-GIFFORD DRILLING MACHINES

At MASON-NEILAN REGULATOR CO., precision holes play a vital part in the accurate operation of a wide range of instruments made by this company to control the flow of steam, air, water, gas or oil.

To speed the flow of precision drilling operations, this well-known manufacturer chooses Leland-Gifford Multiple Spindle Drilling Machines. Multiple Spindles permit rapid handling of drilling, reaming, counterboring, spot facing and tapping operations — in any combination or sequence. Convenient centralized controls; the Leland-Gifford Indicating Shift for fast, accurate speed changes and other built-in safeguards against costly errors all combine to give the utmost in speed, precision and efficiency.

A Leland-Gifford field engineer can show you how to improve production and lower drilling costs with Leland-Gifford Drilling Machines. Phone or write the nearest office for complete information.



LELAND-GIFFORD
Drilling Machines

WORCESTER 1, MASSACHUSETTS, U. S. A.

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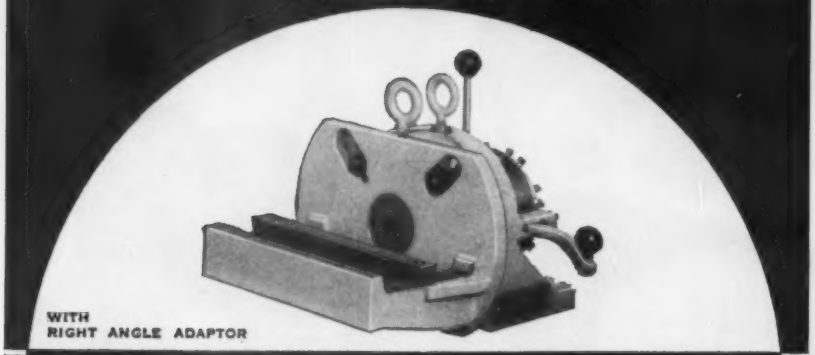
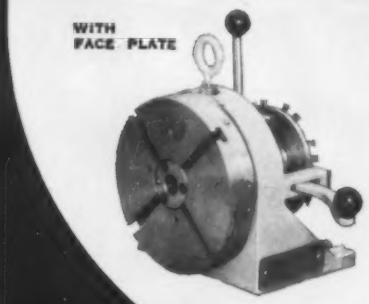
  P. O. Box 1051
- **ROCHESTER 18**
  P. O. Box 67, Roselawn Station

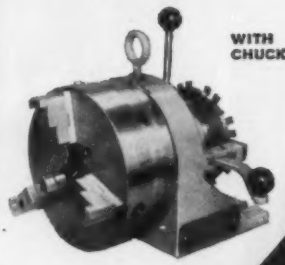
"...one of the most useful pieces of equipment in metal working plants throughout the country."



WITH RIGHT ANGLE ADAPTOR



WITH FACE PLATE



WITH CHUCK

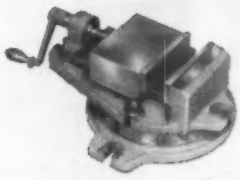
3-WAY

INDEXING TRUNNION

Gives new, *simple* mounting of work or jig plus rapid, controlled rotation to correct angular positions. Used on radial drills, boring mills, planers, milling machines, and sensitive drills.

This is a basic, versatile production unit which speeds up multiple same-piece operations on either long or short runs.

Request Bulletin J7 for complete details.



STURDY, ACCURATE machine vises, made with more than the usual care. Available with or without calibrated swivel base.

UNIQUE, SIMPLE work holder for indexing and positive clamping of difficult parts in milling or pantograph operations.

J&B EST. 1870

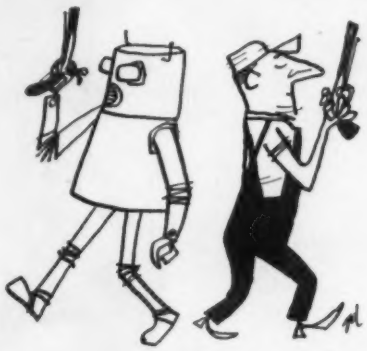
JOHNSON & BASSETT, INC.

PRODUCTION TOOL DIVISION

WORCESTER, MASSACHUSETTS

cooling, and it will be too bad if the idea of its dangers spreads into the shop. Unless we get some genuine medical evidence to the contrary, it may not be long before the unions turn thumbs down on it. This will mean another victory for ignorance, and another valuable technique may lie forgotten for another hundred years. If this should happen, we shall have only the hygienists to blame.

Carl Ostrowski
Buffalo, NY



Pro Bono Publico

It was a real pleasure to read your editorial (*AM*—Mar 28 '55, p111) and to realize that you, at least, appreciate the importance of the human factor. We have been hearing so much, these days, of the productive capacity of automated equipment that most people tend to overlook the really important fact that we are not yet dealing with automatons. The best and most productive of the new equipment is still helpless without a human being to command and control it. And unless that human being can be kept happy and contented, the productive capacity of the machine can easily be brought to nought.

I consider it highly significant that in all the pictures you have shown of automatic equipment at work, you manage to include a fair sprinkling of human operators. This is as it should be, because the people really are there, but many publications appear to be so amazed by automaticity that they purposely stress that angle and deliberately omit any indication of human control behind it.

The current opposition to automation is strangely reminiscent of the days of Arkwright and his spinning frame, when the hand spinners were so afraid that this automatic machine would destroy their jobs that they stormed his house and destroyed it. Yet where would the tex-

tile industry be today if cloth still had to be made by hand?

I congratulate you on your courageous stand in support of automation, as well as on your clear understanding of its far-reaching benefits to the individual worker and to mankind in general.

Robert C Henion
Chicago

The Rolls-Royce Way

You have published so many letters on the subject of old-time workers that I hope you will consider just one more. The system worked out by Rolls-Royce, Ltd, Glasgow, is certainly worth mention. Old-timers (we call them old sweats) are given a chance to continue in useful employment when past age 65, even though they may not be able to stand the stress and strain of production-line routine.

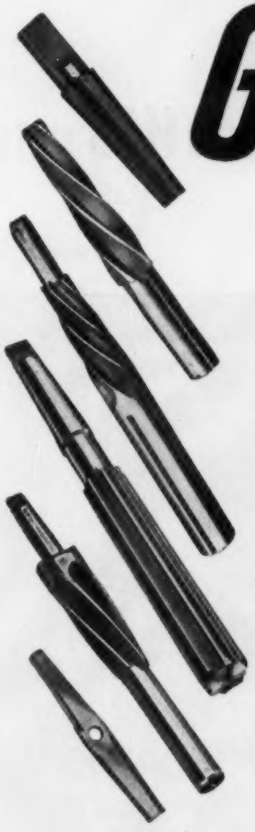
R-R has set up an Elderly Employees Dep't which benefits both the company and the workers. The company is able to retain the use of skills too valuable to waste, even if their owners are too slow for high-production work; the workers get extra cash, plus—often more important—the sense of being needed as active members of society, rather than victims of an age-guillotine.

Men from 65 to 70 are retained at time-rates and, at 70, receive retirement pensions at an increased rate in addition to normal wages. They can start later and finish earlier to avoid the rush hours of transportation, and they enjoy a working atmosphere which is quieter than is possible on straight production work. Recruitment is voluntary and, although numbers are yet small, those who have accepted the scheme are quick to admit its advantages. Work performed by these old-timers includes gage making, precision hand tapping, light drilling, light assembly work, inspection, light salvage, machine engraving, and general light repair work.

Ian Hamilton
Glasgow

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM



They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

14408 WOODROW WILSON • DETROIT 3, MICHIGAN

WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

NEW CINCINNATI 16″ SLIDING HEAD DRILL THAT LOOKS AS GOOD AS IT RUNS

Here is in-the-metal-proof that a drill doesn't have to be homely to be good. The new Cincinnati 16″ sliding head drill can turn your shop into a showroom in appearance and performance.

Operators like this new drill because every important element is conveniently located and built in . . . power take-off, gearbox, feed selector, positive jaw clutch, electrical controls, depth dial, counterbalance spring, contour-fitting belt guard.

Best of all, this new drill can be equipped with power feed at slight additional cost . . . bringing the production advantages of automatic operation within the budget of any shop. Every drill is built to real machine tool standards of accuracy, and tested before shipment. A record of these tests is kept for permanent reference at CL&T. Bench, floor, and multi-spindle models available *now*.

Write for catalog D-138 and name of your local dealer. Cincinnati Lathe and Tool Company, 3245 Disney, Cincinnati 9, Ohio.

CINCINNATI LATHES and DRILLS

THE MACHINE TOOL SHOW
CHICAGO, ILL.
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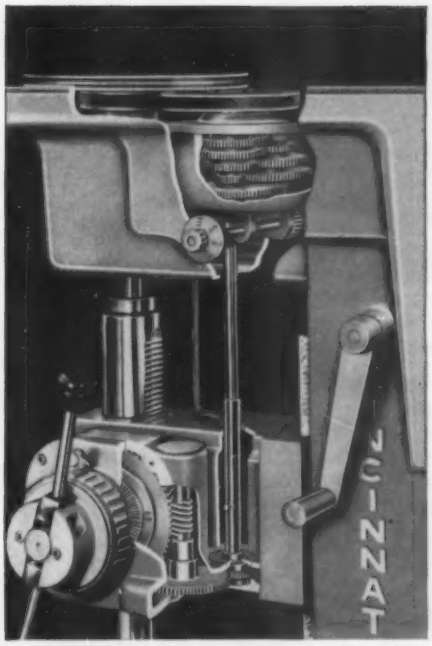
BOOTH NO. 309

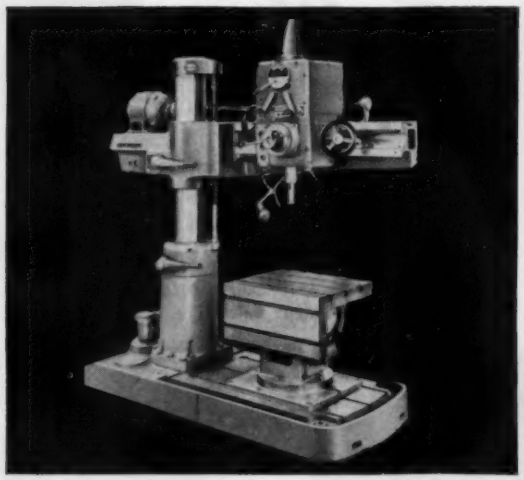


NEW GEARED POWER FEED—Positive jaw clutch engages four power feeds—.002″, .005″, .009″ and .015″ per spindle revolution. Automatic disengage for identical operations. Unit construction.

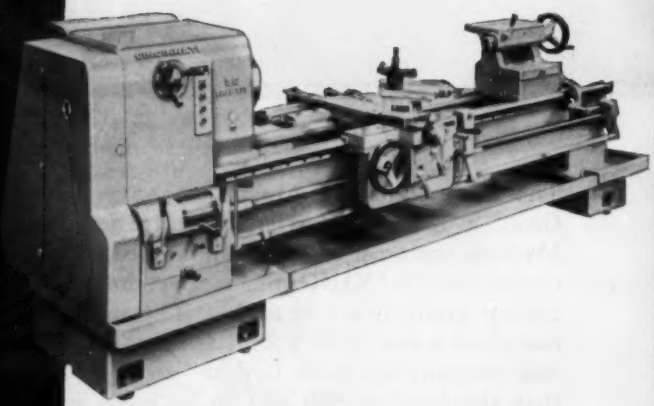
NEW ELECTRICAL CONTROLS—Built right into the head. All drills are shipped *complete* with motors and controls—no installation delays, just connect your power leads, and switch on the motor.

NEW FULL-FLOATING SPINDLE—All this spindle takes is torque! Four precision, sealed, lifetime lubricated bearings (two on spindle and two on pulley) take radial and thrust loads. Six spindle speeds. No. 2 Morse taper is standard; No. 3 Morse taper optional.

SEE THESE OTHER BRAND-NEW CINCINNATI TOOLS



3′ 7½″ Radial Drills with Hard Clad Columns.



10″, 12½″, 15″, 18″, 21½″ and 26″ Tray-Top Engine, Toolroom and Fixed Gap Bed Lathes with Hard Clad Bedways.

center on . . .

cincinnati lathes and drills

New KING VERTICAL BORING & TURNING MACHINE

at THE AKRON STANDARD MOLD COMPANY

Machines "KING SIZE" Tire Molds

25% Faster!

At right — "Akron's" 120" KING machining huge tire mold. *Below*—Close-up view showing forming cut being taken in the mold, amply demonstrating KING "heavyweight" power and rigidity.

The Akron Standard Mold Company of Akron, Ohio, a KING® Vertical Boring & Turning Machine customer of long standing, recently purchased the 120" KING shown above for manufacturing giant-size tire molds. The mold being machined is size 30.00 x 33, the largest size mold this company has made to date—so large, in fact, that the forming tool had to be made in three separate pieces in order to complete the contour.

Mr. W. P. Voth, President of The Akron Standard Mold Company, reports this new KING "amply fulfills our requirements . . . and turns out work even faster than we anticipated." Mr. Voth estimates that this new KING has increased production on large size molds by 25%.

Here is more on-the-job evidence of typical KING performance . . . the kind of evidence that explains why KING today, as in the past, is industry's logical first choice for fast, accurate, profitable production. KING Machines are made in 10 sizes, 30" to 144", in a wide variety of head combinations. See your KING Distributor, or write to us direct, for complete specifications and illustrated description of construction features.

Visit us at Machine Tool Show — Chicago, Sept. 6-17 — Booth 1121

American Steel Foundries

KING MACHINE TOOL DIVISION

1150 TENNESSEE AVENUE CINCINNATI 29, OHIO

Spot News of Metalworking . . .

New way to make welded tubing resistance-heats edges with HF current (about 400 kc per sec) applied through sliding shoes positioned 1-2 in. from weld point to achieve progressive heating. Conventional squeeze-rolls make the final weld. Designed for aluminum by New Rochelle (NY) Tool Corp, method works on 100%-pure copper, steel, and stainless, too. Alcoa of Canada is using this method to make aluminum tubing 4 in. OD, 0.050-in. wall at 113 fpm.

When workers strike against themselves, it's one for the books. Employees of Cleveland Pneumatic Tool Co (whose factory production workers' fund owns 49% of company stock) almost did it recently, but their independent Aerol Aircraft Employees Association settled through federal mediation for an 8½¢-an-hour raise, a better vacation plan and other fringe benefits.

Outlook for press business is so good (heavy current demand from auto firms, even better prospects in the future) that several suppliers of equipment to press builders are undertaking major expansion programs.

Boride-based material for cutting tools has been developed by Rand Development Corp, Cleveland, which claims tests show 2-4 times wear life of tungsten carbide tips. Material (a combination of boric acid, TiO_2, carbon black and small amounts of moly and nickel for binder) is made by powder metal techniques. Tools are formed by hot pressing in a carbon mold.

Some 200 German firms are going into aircraft parts output this month. And now that the lid is off on German airframe building, you can look for brand-new modern-design German planes by the end of 1956.

First cutback of steel orders from the auto industry this year will come sometime this month, substantiating reports that third quarter auto output will be 20% under second quarter. This reflects model changes, rather than less demand.

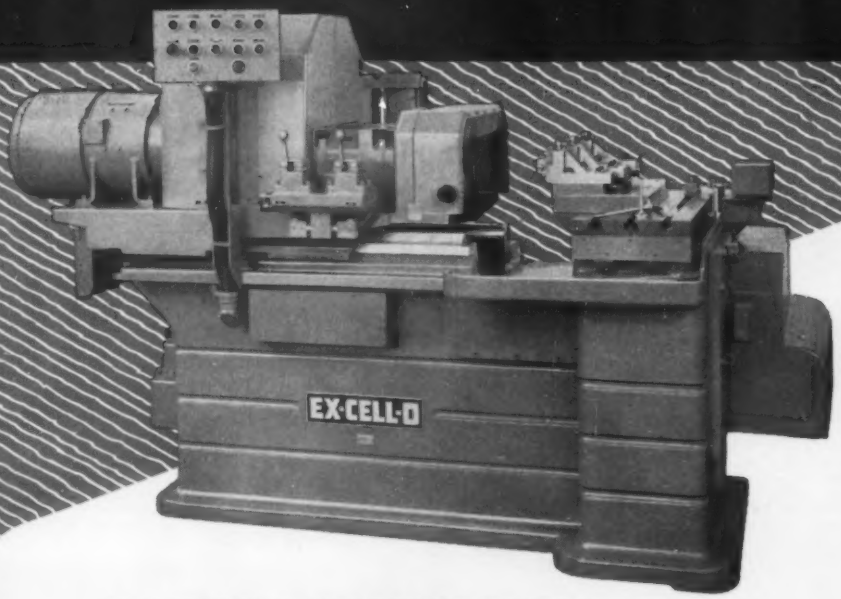
Alcoa will install the world's biggest aluminum plate stretcher, capable of exerting a two-way pull of 16-million lb, at its Davenport, Ia, works for the Air Force at a cost of $10 million. New setup will also include the world's largest heat-treating facility. End result: heat-treated plate up to 144-in. wide, 60-ft long, up to 6-in. thick.

First financing plan for buying a complete industrial laboratory is being offered by a Chicago firm. The idea: to give the small firm a chance to meet big competitors' quality control and research and development standards.

Noisy machine tools are being used as a compensation crutch by some auto workers, who claim they're deafened by the machines. Whether the claims are true or false, they cost the auto companies plenty. Result is that the companies are demanding machine tools with low decibel ratings.

NEW EX-CELL-O MACHINE

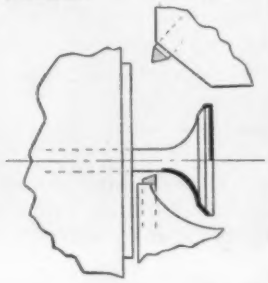
contours valves by direct cam action (no levers)



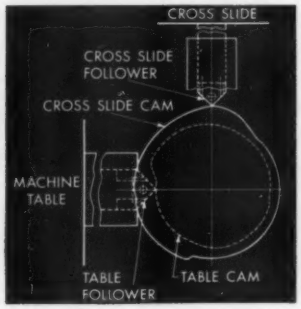
Ex-Cell-O's new Style 312 Precision Boring Machine operates with direct cam action—is fast, accurate, automatic—is solid and rugged to handle tough jobs of precision contouring, boring, turning, facing, and grooving. For full information contact your Ex-Cell-O representative or write Ex-Cell-O in Detroit.

NEW EX-CELL-O CAM BORING MACHINE, Style 312, equipped with two spindles and tooling for operations on valve heads.

VALVES ARE CONTOURED, faced, turned, and taper-turned. This drawing shows the two tools used in each station. The paths they follow on the workpiece are indicated in heavy lines.

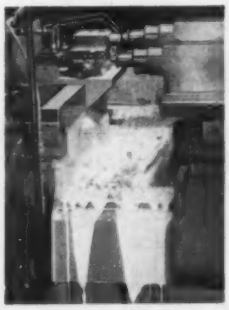


CONTOURING ACTION: Cams act directly on the slide—NO LEVERS. Separate cams for table and for cross slide are both on one shaft, giving exact co-ordination.



CAMS CHANGED IN MINUTES: Cam assembly swings out for quick change of operation. All motors are outside the base.

SEE EX-CELL-O AT THE MACHINE TOOL SHOW CHICAGO, SEPT. 6-17 BOOTH 1319



CHIPS, COOLANT CANNOT ENTER THE BASE. Large chip chute is cast integral with the solid top of the heavy nickel iron base.

XLO
EX-CELL-O for PRECISION

55-1

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DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington . . .

Red Air Power Gains . . .

Washington is badly upset over new revelations of Russian air power. Recent flying displays over Moscow showed that the Reds have made tremendous progress in design and production of long-range jet bombers and supersonic fighters—much more progress than U S military experts had foreseen in their crystal-ball gazing.

The Reds showed more than 40 new medium bombers; at least nine turbo-prop aircraft that could be used as bombers, aerial tankers, or long-range reconnaissance planes; over 50 new supersonic day fighters; more than 30 all-weather interceptors; and at least 10 heavy bombers. Some had been seen before—but only as one or two prototypes, never in production quantities. The new day fighters hadn't been publicly displayed at all.

Some experts claim the Russian planes are comparable if not superior to U. S. models now in operation. Official Pentagon line, however, is that we're still maintaining "a military capability superior to that of any potential enemy."

At first, the Pentagon tried to play down the news of new Red air developments. In a brief and cryptic announcement, the Pentagon first said only that the Russians had shown some new planes and that the observations will "establish a new basis of our estimate of Soviet production." Later, after private sources had disclosed the types and numbers of planes displayed, the Pentagon came up with a new announcement—more lengthy and specific.

Meanwhile, a big squabble is brewing in Congress over the issue. Sen Stuart Symington, former Air Secretary disagrees with the Pentagon. He says the U S "may have lost control of the air" to the Russians.

So far, however, Defense Secretary Wilson says no serious thought is being given to an increase for the 137-wing Air Force Program or to a request for bigger funds to back up U S military aircraft research and development.

Biggest Military Contractors . . .

Nineteen firms—mostly aircraft—landed over half the orders let by the Defense Dept in the 18 months after Korea. Top companies were United Aircraft, Douglas, North American, Boeing, Lockheed, and General Dynamics. The total on all military business since the start of Korea shows GM on top with $6.6 billion, then Boeing, $5.2 billion, Douglas and United Aircraft, $3.9 billion each, and GE, $3.7 billion.

Reserve Turbine Capacity . . .

ODM seeks Congressional approval this month to buy $64 million worth of machine tools as reserve lines for high-pressure steam boilers and turbines and turbine-driven reduction gears. It will come up as the Defense Production Act Extension is considered.

As the plan stands now, the tools would be financed through the $2.1-billion Borrowing Authority set up under the law. Actually, Congressional approval isn't needed for each expenditure from the fund. But ODM considers the turbine-tool deal a special case. The plan has been okayed by ODM's Vance Committee. But another agency committee that passes on use of the Borrowing Authority has ruled against the deal.

The money is really a revolving fund—the government getting repaid on expenditures. For instance: $836.5 million has been committed to buy equipment for rental to machine-tool builders under the Korean Expansion Program. Over a period of 70 months, this money will be returned to the government, ODM figures, through rental payments. But in the case of tools for turbine makers, there would be no such return. In fact, the government would likely pay for maintenance of the tools.

ODM officials do not argue about the requirement for reserve capacity. But they feel such expenditures should come from the military budget, not the DPA Borrowing Authority. Says one official: The Navy has long known about the shortage of propulsion turbine capacity. In fact, he says, reciprocating engines instead of turbines were used in WWII because of lack of capacity to make high-pressure turbines. He argues that the Navy should buy its own reserve turbine capacity through the Pentagon's Special Reserve Tool Program or seek its own direct appropriations. Actually, at least $1 million of the Navy's $14.2-million allocation from the Defense Dept.'s fiscal 1955 $100-million Reserve Tool Program is earmarked for turbine capacity.

Is There an Engineer Shortage? . . .

An upcoming government manpower report will deflate stories about general shortages of engineers and scientists in industry. The report is based on a survey made for the National Science Foundation on engineers and scientists employed in industrial research and development. Over 175 big firms who account for the bulk of industrial R&D were covered.

This is what the report will say: Scientist-engineer shortages are exaggerated. The only real shortages—at least in R&D and maybe in all industry—are for people with lots of experience in very narrow specialties. This is mainly in the aircraft and electronics industries. There is no lack of young engineers and scientists fresh out of college.

About half the firms surveyed said they are unaffected by manpower problems. The report is sure to stir up plenty of controversy. It will be welcomed by military and other officials who have opposed special treatment for draft-age engineers and scientists.

The man who needs a new machine tool and doesn't buy it is paying for it anyway...

in lost production

Because costs are set largely in labor and burden, lost production is reflected directly in high unit cost. Old equipment is not the only cause. Failure to utilize the latest processing techniques may be keeping you from increasing production and lowering unit cost.

For example, consider the low-velocity, controlled-abrading Microhoning process which combines stock removal, geometric accuracy, size control and surface finish to increase *production* and *precision*. Inherent characteristics of Microhoning eliminate such downtime factors as tool sharpening, fixture and machine aligning.

The difference between your current output and the production possible with Microhoning will, in a short time, cover the cost of new Microhoning equipment. And until you do utilize the most efficient processing techniques, you are paying for new machine tools you don't have.

PART:
Connecting rod—wristpin and crankpin bores.

PROBLEM:
High unit cost; how to increase production without increasing labor or burden cost.

SOLUTION:
Microhoning—simplified processing of wristpin bore (eliminating 3 operations); gross production increased to 600 bores per hour, within all specified tolerances.

*MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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Buick and metalworking . . .

"To make money, you've got to spend it . . ." could well be the dominant theme behind any conversation a metalworking management man might have with Ivan L Wiles, general manager of Buick. And that, of course, could only be good news to the metalworking industry.

Consider, for instance Wiles' views on yearly model changes. He recalls Buick's dismal experience two decades ago when no styling change whatsoever was made in 1935 models. The 1934 and '35 models were twins, and the resulting sales sag proved to Wiles that no automaker can risk introducing a relatively unchanged model from one year to another.

"I don't think (car makers) dare. I don't. I think the biggest mistake you can make is not to make every improvement you're able to. No matter what it costs, it's dirt cheap." Expansive words from a man who began his automotive career in 1922 as an accountant with Marmon Automobile Co, followed that with six years' work for an accounting firm, then returned to autos to work for Oakland Motor Co, Pontiac predecessor. "I've spent all my life as an accountant, and cost is what an accountant thinks of, first, last and always. But I got that taken out of me quickly, in the auto business."

Buick won't try to slip by . . .

There's little chance, then, that Buick will ever try to slip by from one year to another with the sort of inexpensive facelifting commonly given autos in the years of scarcity after WWII. (That's not so all over the industry—one or two 1956 nameplates are going to be difficult to distinguish from 1955s.) "We (the industry) have been accused of holding back improvements." But, Wiles adds, his division isn't holding back. "We don't save anything.

What does that mean for *AM* readers? Simply that Buick (and incidentally other GM divisions—as a GM vice president and director, Wiles is also fully informed of the plannings of Olds, Chevrolet, Pontiac and Cadillac) can logically be expected to continue the same sort of major change it made in '55s. Having made a full rubber-to-roof alteration in its '54s, Buick might have been counted upon to make only token changes in '55. Instead, it invested about $37.5 million in '55 changes, which brash outlay admittedly caught a competitor or two by surprise. The '56 change likely will be as expensive (last fall, when the current model was previewed, one of Wiles' top aides was heard to say: "If you think this is a big switch, you ought to see what they're making us do for 1956.")

Then, if the presently normal pattern is adhered to, another new and costly body shell with equally new and costly body improvements will be shown.

The push for second place . . .

Buick's steady success in 1954-55 is a main element behind Buick's push. It shoved Plymouth aside in the sales standings and moved into third place behind Chevvy and Ford. It appears a good bet to finish 1955 in third. In autos, it isn't enough to try merely to hold present position. So Wiles and his general sales manager, Al Belfie, have set up a new, generally unpublicized goal: second place in the industry—easily the most ambitious undertaking mentioned by any auto maker this year. Both Ford and Chevvy last year outbuilt Buick by a margin of roughly 3 to 1.

Nobody at Buick is disposed to spell out the colossal program. Wiles gives one immediate clue: "You may remember that I said last fall that our goal was to produce and sell 750,000 cars a year by 1960? Well, that's upon us less than a year later." An all-out production push comparable to that displayed in 1950 (when it had fewer facilities) would permit annual output of almost 1 million units with present facilities. But that would entail virtually 100% utilization of manpower and facilities. As it is, Wiles says that raw materials and component inventories are so low that "if so much as one carload of engines, bound for the West Coast, is diverted, we're in trouble." A seam-busting 1-million-units-a-year is far from ideal, facilitieswise, suggesting that if Buick is to make a real run for second place, it will have to expand foundry facilities, engine and assembly plants, etc. Wiles offers no details as to when and where expansion might be expected to start—does not, in fact, even admit that expansion is planned. But the speed needed to pass either Chevvy or Ford can come first only from more productive capacity.

That new Ford nameplate . . .

How about the threat posed by Ford's plans to put a new car in its line-up in two or three years, a car that would compete with Buick's big Roadmaster? "I see no need for a new model," says Wiles. "We already cover the market. I see nobody getting too close to us in a factor that I use: Competitive list price per pound of car." Wiles maintains that no competitor can meet Buick on that basis—a factor upon which he seemingly believes the public bases, perhaps unconsciously its car-buying habits.

One exception to the new series ban: The Skylark, the 1952 model of which was the style setter for the entire '54 Buick line. Should it ever again want to test public reaction to an importantly different car fashion, Buick probably would resurrect the Skylark, which is now out of production. New series or no, Buick, already a big spender, will doubtless lay even bigger sums on the line in years ahead.

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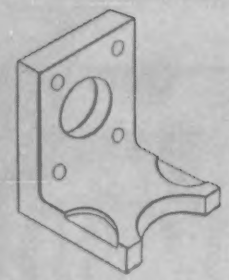
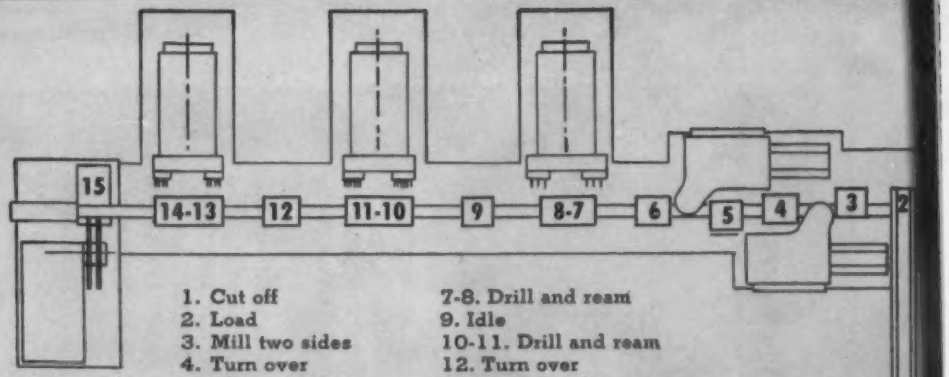
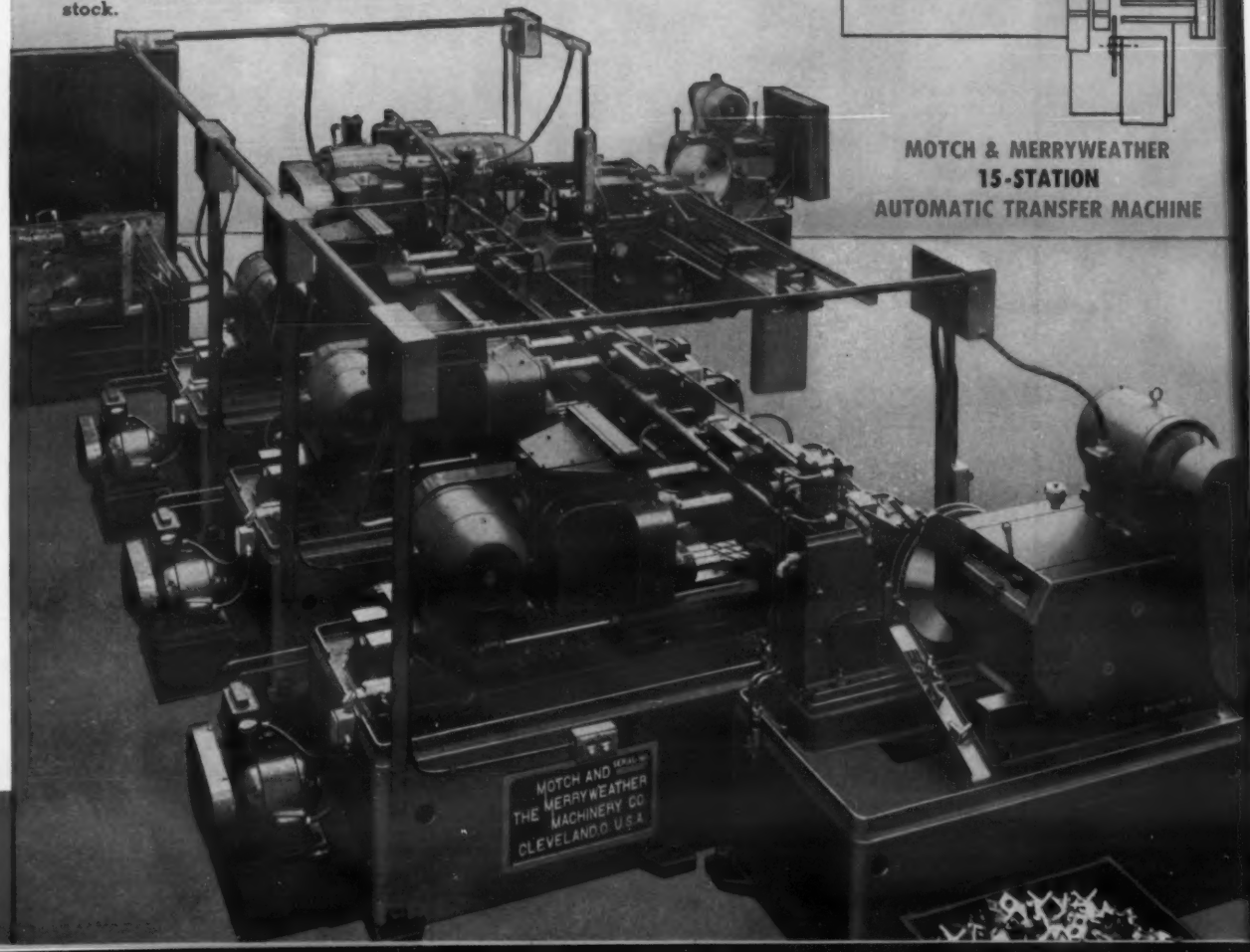


Part Name:
Cylinder bracket.
Production:
384 pieces per hour.
Material:
3" x 2½" x ½" angle iron, standard milled stock.



1. Cut off
2. Load
3. Mill two sides
4. Turn over
5. Mill two sides
6. Idle
7-8. Drill and ream
9. Idle
10-11. Drill and ream
12. Turn over
13-14. End mill
15. Saw 3 pieces to length



MOTCH & MERRYWEATHER
15-STATION
AUTOMATIC TRANSFER MACHINE

Machine Tools . . .

Turbine-gear tool program delayed . . .

Prospects appear slim for government purchases of reserve machine tools in the near future, aside from the $100 million currently being spent by the armed services (principally the Air Force) and the $100 million more for fiscal 1956.

Despite endorsement of the turbine-gear program by the new Vance advisory committee, ODM Mobilizer Arthur Flemming will not dip into the Borrowing Authority's fund to finance it without specific approval by the House and Senate banking committee.

He hopes to get the committee's blessing when he testifies before it in connection with the renewal of the Defense Production Act.

If he then should proceed, he will be doing so over the vigorous opposition of ODM's Borrowing Authority Review Board, which regards the use of Borrowing Authority funds for reserve machines as "an abuse." For details of this situation, please see p 107.

Elephant tool program stymied . . .

The $40-million elephant tool program is not likely to get anywhere until the turbine-gear program moves off dead center. It too is dependent upon Borrowing Authority money for its financing.

About 1000 privately-owned elephant tools are in place in 187 metalworking plants, according to a report made by BDSA to ODM.

BDSA feels that this number should be greatly expanded by ordering reserve elephant tools sufficient to meet full mobilization requirements. Originally the orders were to cover some $40 million of "elephants." But BDSA thinks that two or three times that amount must be spent.

ODM meanwhile has asked BDSA to revise its elephant tool proposals and to outline "a plan of action."

A survey of government-owned "elephants" is being made by ODM, whose officials express surprise that they have uncovered so many.

Navy wants bigger share . . .

The Navy is loath to let the Air Force run away with the lion's share of the $100 million of reserve machine tools to be bought by the armed services with the $100 million in the fiscal 1956 budget. The Air Force got 84% of the $100 million in fiscal '55.

Accordingly the Navy is busy surveying its machine tool needs. It intends to come up with some good projects to get more than the $14 million allotted it in the current year.

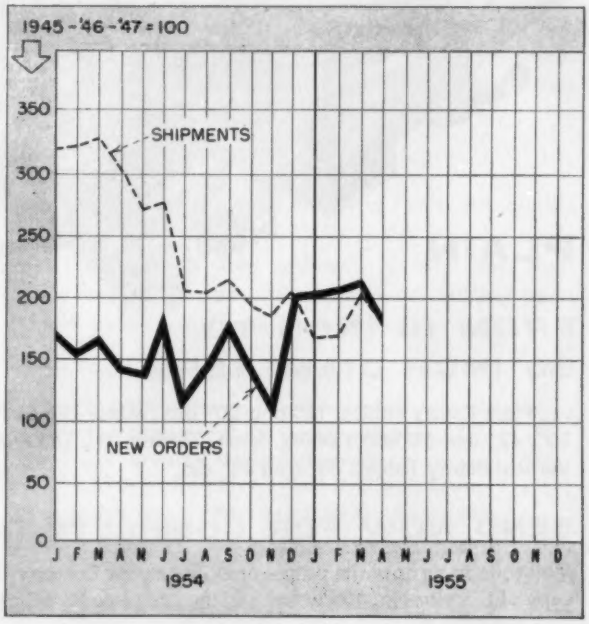
Machine tools state-controlled . . .

A proposition "to bring sections of the machine tool industries into public ownership" was made by the British Labour Party during the recent election campaign. This proposal was first made by party officials in June, 1953.

It immediately prompted a statement by the Machine Tool Trades Association of Great Britain that the proposal "shows a dangerous ignorance of the industry's constitution." Moreover, the MTTA said that "the whole idea of nationalizing sections of the industry is unworkable because . . . . it is quite impossible to split manufacture of machine tools into clear-cut parts."

State ownership has never yet succeeded in competing with private enterprise, the MTTA pointed out. "The failure of the Eastern European machine tool industry to reenter the international field where competition is keenest is significant evidence of the stultifying effects of state control."

BF



APRIL MACHINE-TOOL NEW ORDERS AND SHIPMENTS registered a decided drop-off from March levels, with both new orders and shipments at an identical figure on the National Machine Tool Builders Association Index—180.8. New orders were down from 214.6 in March. Shipments were down from 202.5 in March. New orders, however, were far ahead of April 1954's 142.8. And April shipments were ahead of those for January and February 1955

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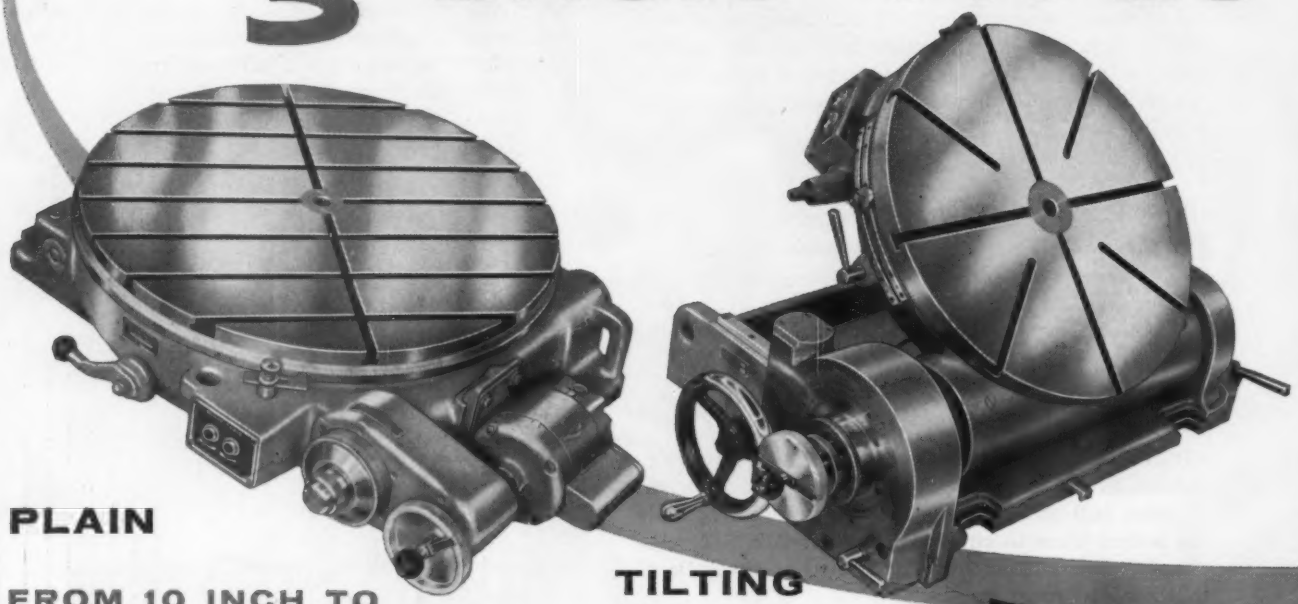

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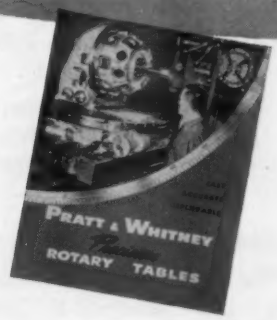

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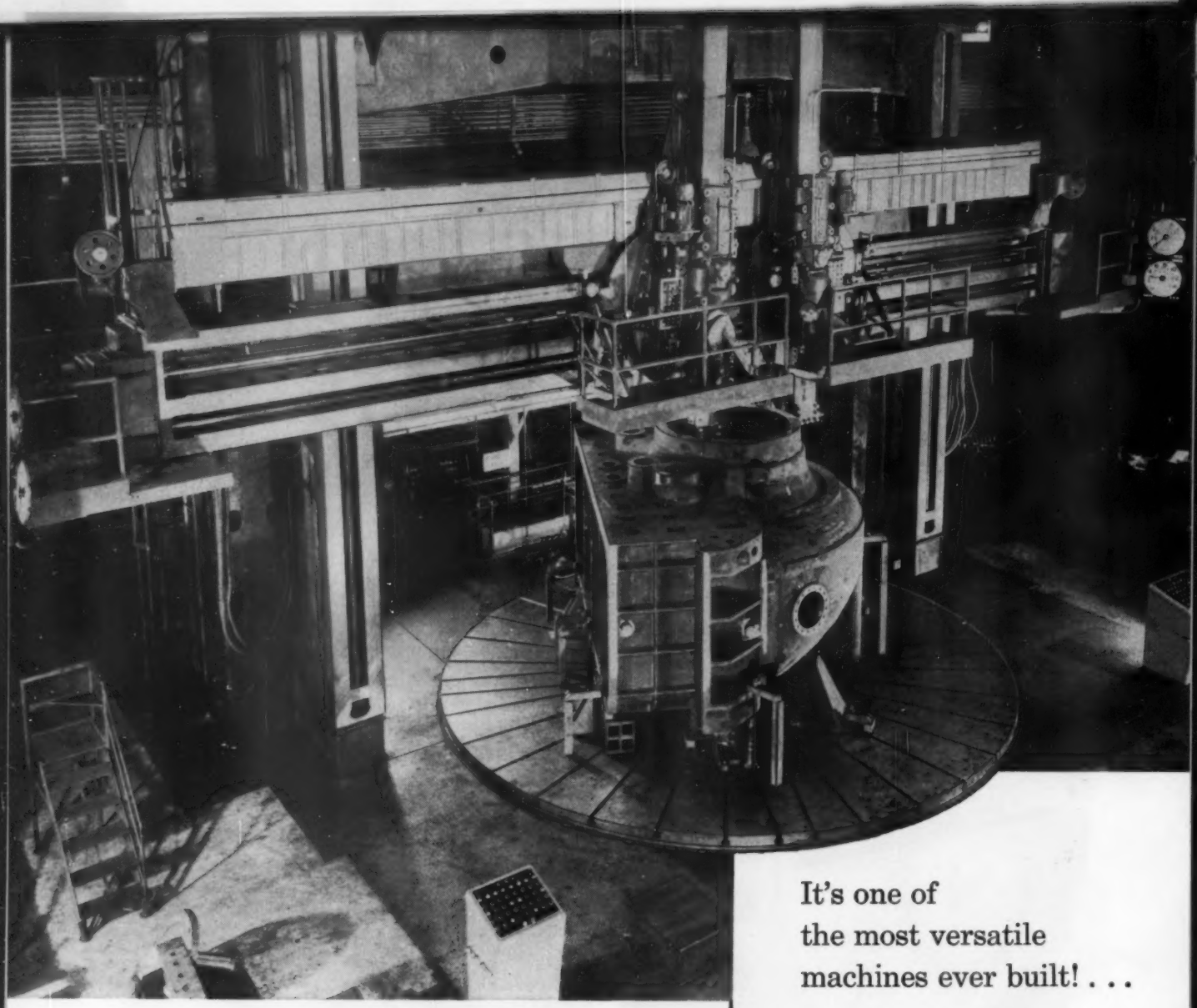

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"Advanced controls and speed ranges which will remain modern for decades were what we wanted in a 30-foot boring mill," Allis-Chalmers reveals. "This Niles-built mill at work in our Milwaukee plant has fully met its high expectations.

"It is felt that its ruggedness and reliability will equal that of the 40-foot mill built by Niles in 1928 and in continuous operation at Allis-Chalmers for 25 years."

New Catalog! Write for details on the Niles standard line of vertical boring mills to 43 feet, side-head mills to 54 inches, 6-inch horizontal mills, heavy duty engine lathes to 120 inches.

It's one of the most versatile machines ever built! . . .

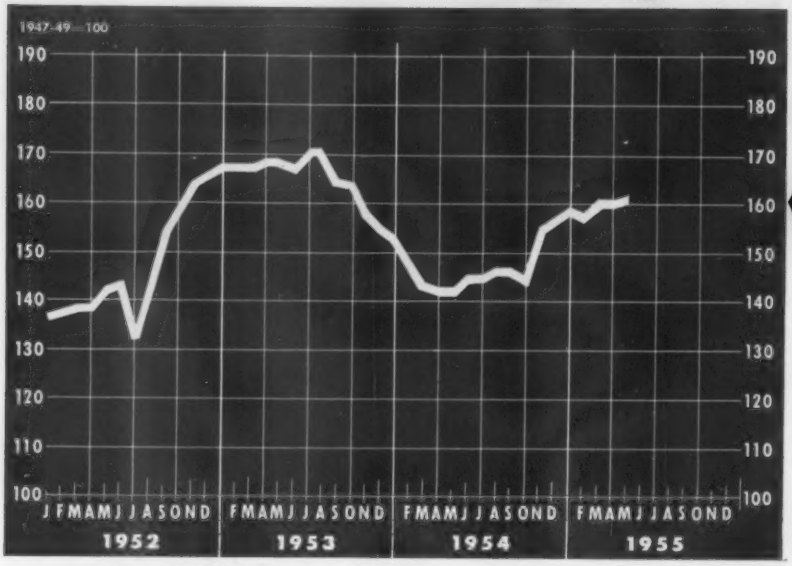
- ★ Electrical control of all movements except where hand setting is desired
- ★ 45-degree motor-operated swivel of boring bars
- ★ Four station electrical control
- ★ Detachable milling head
- ★ Automatic warning of incorrect lubrication
- ★ Maximum swing—30 feet, 5 inches
- ★ Maximum height under tool—17 feet
- ★ Bar travel—10 feet

BALDWIN BLH LIMA-HAMILTON

BALDWIN—LIMA—HAMILTON

Hamilton Division, Hamilton, Ohio

Gaging Metalworking . . .



Production Index

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	MAY '55(*)	APR '55(p)	MAR '54(r)	APR '54
Total Index	**161**	**160**	**158**	**146**
Machinery	**130**	**126**	**126**	
Electrical Machinery	**186**	**185**	**163**	
Autos	**164**	**157**	**107**	
Other Transportation	**260**	**264**	**286**	
Other Metalworking	**133**	**131**	**122**	

(*) Estimated (p) preliminary (r) revised

AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

Metalworking continues to hold own . . .

Metalworking is holding its own at near-record levels, despite the proximity of summer.

The extraordinary production performance this year has been without benefit of much defense business. Manufacture of military items shrank drastically in 1954 compared with 1953, and has gone down further this year.

The kind of activity now bolstering metalworking production comes from both the capital goods and consumer fields.

It is hardly news any longer that the automobile industry and home appliance people are among the chief factors in supporting Metalworking at the level to which it has become accustomed this year.

The outlook in these two industries is for high output this month, unless a major strike should occur at Ford or General Motors.

Business well diversified . . .

Best of all, other industries are doing very well. Example: One large company with interests in many segments of Metalworking reports sizable gains this year over last. Farm tractors, for one, are up 26%. Earth-moving equipment has risen 34%.

Farm implement demand, aside from tractors, has gone up. But the rise is not as spectacular as in many other lines.

Industrial machinery orders have not followed any particular pattern. Engines and turbines, pumps and compressors, and construction and mining machinery had big Aprils.

Metalworking production machinery, on the other hand, trended downward. But in this category, April has been below March in each of the past four years. For detailed reports on industrial machinery, including charts, please turn to p 183.

Defense business still declining . . .

Reports from three different industries—industrial furnaces, gear manufacture, and cutting tools—are optimistic, with the order volume in all three cases running well above that of last year.

Defense business seems to be declining steadily as a factor in almost all parts of Metalworking except the airplane industry. Plane production this year will not be far from the 1954 total.

The construction industry is providing plenty of work for metalworking companies. And this source of business is expected to continue strong, though housing shows signs of tapering a bit.

Steel demand to be good . . .

Steel orders for the third quarter are coming in at a brisk pace. Fear of a falling off in demand has disappeared, and mills are confident that tonnage shipped in the summer months will be very large.

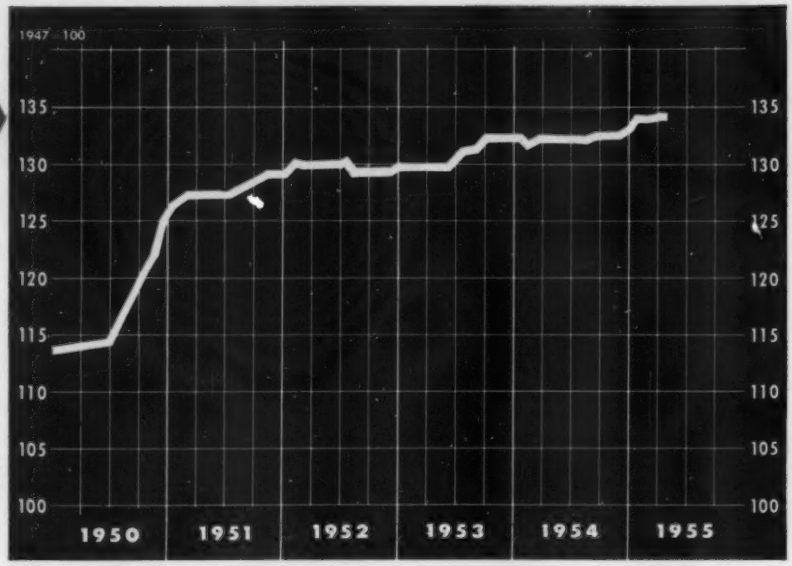
Many tool and die shops report a marked improvement in new business lately. Shops making molds for plastic molding are especially busy.

Railroad freight car industry still is slow. Nevertheless, new orders recently have been ahead of those in '54. Backlog of 18,000 is about equal to that a year ago.

Gaging Business . . .

Price Index

	MAY Estimated	APR. Preliminary	MAR. Revised	APR. Year Ago
Total Index	**134.5**	134.3	134.2	132.6
Metalworking Machinery		146.3	146.2	141.6
Other Machinery exc. Electrical		139.2	138.9	137.5
Electrical Machinery		131.6	131.6	131.7
Fabricated Metal Products		130.6	130.5	128.9



AMERICAN MACHINIST INDEX OF METALWORKING PRICES

1955 to break all records . . .

Business promises to be better this year than any peacetime year on record.

As midyear approaches, it becomes apparent that the total volume will top that in 1953 by a comfortable margin. That is much more than had been hoped for.

Our national production in 1955, as measured by the value of goods and services produced, should reach $375 billion.

This is at least $10 billion higher than GNP in 1953. Last year, the total was $357 billion.

FRB index at high point . . .

Industrial activity, as determined by the Federal Reserve Index, probably will average more than 135 for the year, with 1947-1949 taken as 100.

This educated guess is made in the face of an expected letdown in auto and housing output.

Previous all-time peak was 134 in 1953. The FRB index averaged 125 in 1954. The increase this year thus is impressive.

Employment situation satisfactory . . .

A high level of employment prevails, government statistics indicate. And there are a declining number of people without jobs. However, employment has not risen at the same pace as output.

Non-farm employment went up 400,000 during April—sharpest March-to-April gain since 1950.

Most of the increase stemmed from the construction, trade and services industries. Most significant of all, however, was an expansion of 40,000 in manufacturing. General trend in factory jobs in the postwar years has been downward from March to April.

Record number of new firms formed . . .

Corporation profits in the first quarter hit an annual rate of $20 billion, after taxes. The total for the year may well be $21 billion.

That is within 5% of the all-time peak profits in 1950, when taxes were lower than now.

Almost 50,000 new businesses came into being during the first four months of 1955. This is the greatest number in history for that period.

WEEKLY BUSINESS INDICATORS

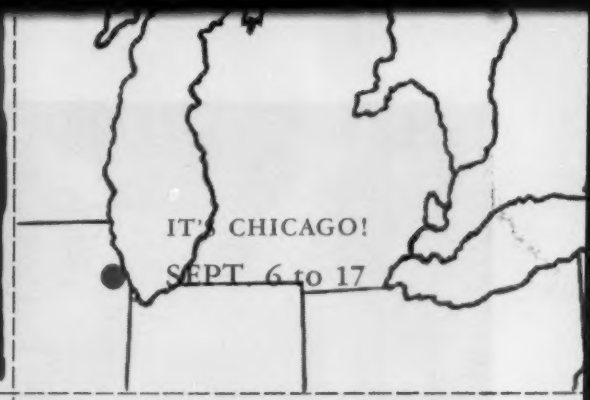
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949 = 100)*	143.1	142.8	124.7
Steel ingot operations (thousands of tons)	2,324	2,338	1,698
Electric power output (million Kilowatt hours)	9,730	9,673	8,373
Production of automobiles and trucks	218,972	221,746	158,023
Engineering construction awards (*Eng. News-Record*—millions)	$402.7	$475.7	$288.5

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)	$370.0	$362.0	$355.8
Expenditures of new plant and equipment (millions)	$ 27.4	$ 26.0	$ 26.9
Profits after taxes in primary iron and steel industry (millions)	$230	$146	$205
Profits after taxes electrical machinery industry (millions)	$203	$146	$163
Profits after taxes machinery (except electrical) (millions)	$175	$196	$184
Profits after taxes in motor vehicles and parts industry (millions)	$275	$191	$233
Motors and generators new orders index (1947-1949 = 100)	156.7	129.7	144.6

*Seasonally adjusted

New



Series 90 Dyna-Shift

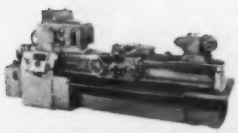
Metal-working

Don't miss the NMTBA's Machine Tool Show in Chicago—September 6 to 17 and don't, for better business' sake, miss our Monarch display there!

Object of the show, of course, is to demonstrate what the industry's best engineering brains have developed in the way of machines that lower costs by improving both output and accuracy.

Techniques—for

We'll be there, for instance, with a great many new lathe improvements, including two freshly announced this year. Those would be our new Series 90 Dyna-Shift Heavy Duty Lathe, plus the new Series 62 Preselector Dyna-Shift. So productive and so absolutely different as to defy comparison, they are two of many reasons why you cannot afford to miss *the world's best investment—in action.*



Series 62 Preselector Dyna-Shift

Business

We'll have more, too. And looking them over will be good for business—yours and ours, both. See you at the show! . . . . . THE MONARCH MACHINE TOOL COMPANY, SIDNEY, OHIO.

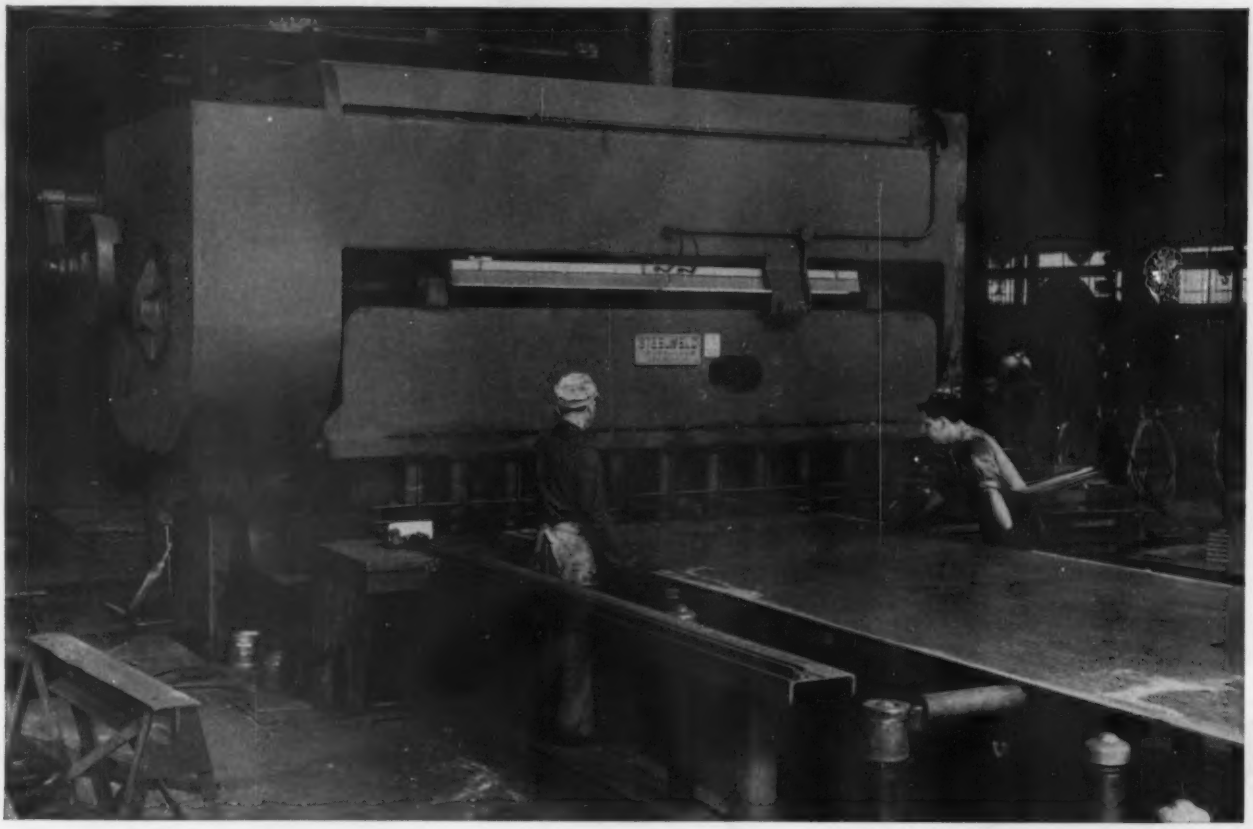
Advance-ment

Monarch

ACCURACY • ECONOMY • LONG LIFE

TURNING MACHINES

FOR A GOOD TURN FASTER . . TURN TO MONARCH



Steel plates up to 10' x 1" are quickly cut on this Steelweld. A complete line of machines is available for every thickness from light gauge to 1½" and every length from 6'-0" to 24'-0".

Pivoted-Blade Shears Outstanding for Heavy Plates

WHILE Steelweld Shears are used in hundreds of plants for cutting every gauge of metal, it is on heavy plate where the easy accurate cutting action of the machine is really eye catching. With nothing more than a quick "oomph" the knife goes through the metal quickly and cleanly, seemingly without effort. The resulting cut edges are straight and sharp.

Steelweld Shears are now cutting steel up to 1½ inches thick. A wonderful feature is the ease and speed with which the heavy plate machines can be adjusted to cut the lightest gauge metal. In a matter of seconds the clearance between the knives can be reduced to that known to provide the best result for the thickness of the plate being cut. This is done simply by turning a crank until a gauge indicator is on the correct thickness figure. This feature is known as MICRO-SET knife adjustment and is the talk of the industry.

Production is fast on Steelwelds because they are heavily built to enable high operating speeds. Also, they are equipped with electric foot control. This reduces operator fatigue and often eliminates many steps he must take to the machine.

If you want the most modern machine, with outstanding features that make for the finest in all around performance — tried and proven features, some of which are not obtainable in any other shear — we invite you to get the facts on Steelwelds.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

1447 EAST 282nd STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Formula for Prosperity

It is hardly news any longer that industrial production, after a shallow dip last year, is back up close to the 1953 postwar peak.

It is news, however, that the situation at present is radically different from that of two years ago.

Then, the national defense production program provided the great stimulus to our economy. Today, the opposite is true. The Pentagon has faded perceptibly as a major contributor to our industrial prosperity.

Industry and business are doing fine. **But most of the uplift has come, as it should, from a healthy demand for all kinds of civilian goods from consumers who have money to spend and are willing to spend it.**

More than that, our 1955 prosperity stems from an impressive outlay of tens of billions of dollars by industry and business for new plant and equipment. Sales of durable goods have been at a high level. Scarcely ever in our history have capital expenditures been as large as they promise to be this year.

Just why all of this vast outpouring of money for new plant and equipment, with federal government funds contributing to it only negligibly?

Because industry believes that the nation's economy will expand substantially the next five to ten years. There will be a lot more people in America in 1965 than now. And the people will have more money to spend. The percentage of families with incomes above $5000 has risen sharply since World War II; and indications are that this trend will continue up for some time ahead.

This is the kind of prosperity that is the best of all. It does not lean on a Washington crutch. Yet Washington has had a hand in it to the extent that the administration has been successful in creating an atmosphere in which industry and business thrive.

It is the kind of prosperity that gives the lie to the Russian theme that the free enterprise system is decadent and rotten at the core and soon will collapse. If the leaders in the Kremlin believe their own propaganda that capitalism will crash some day, we predict that they will have a long wait.

Even so, we cannot afford to be complacent, as the American Machinist Metalworking Production Index pushes a good 160 and the Federal Reserve Index stays around 136.

Prosperity does not come and does not stay willy-nilly. There is nothing in the foreseeable future to indicate another vast defense production program.

If we are to have a continuation of industrial prosperity, it must be based on a vigorous civilian demand for durable and consumer goods, the kind of demand that has existed thus far this year.

This is a challenge to all of us, a challenge that must be met without resort to Washington. Each metalworking manufacturer should do his part by using every means at his command to keep production costs down to a level enabling him to sell his products at a price that will widen his market as much as possible.

He must be willing and able to take advantage of the new production equipment now available or soon to be available, and the automation that goes with it. He must everlastingly be improving and redesigning his product or designing new products that obsolete the old, whether he makes durable or consumer goods.

In short, we must put to work even more horsepower in industry than we have in the past. Development of new technical processes must be richly nourished. **A combination of the two makes for a constant increase in productivity, greater purchasing power by the worker, and a steady demand for durable and consumer goods. That is the formula for prosperity.**

Burnham Finney

NO down time

in 16 years

● Flour Storage Bins—each 1000 lbs. capacity

Photos courtesy Century Machine Company, 4344 Marbury Avenue, Cincinnati 9, Ohio

The records of the Century Machine Company show "no down time in sixteen years use" on this Cincinnati Press Brake.

This machine, working a 9½ hour day, forms light gauge sheets in mild and stainless steel up to ¼" thickness. It is constantly producing accurate parts for easy assembly of Century's baking ovens and bakery machinery.

Write for new Press Brake Catalog B-4 describing Cincinnati Interlocking All-Steel construction, Centerline Loading, deep rigid beds and rams.

THE CINCINNATI SHAPER CO.

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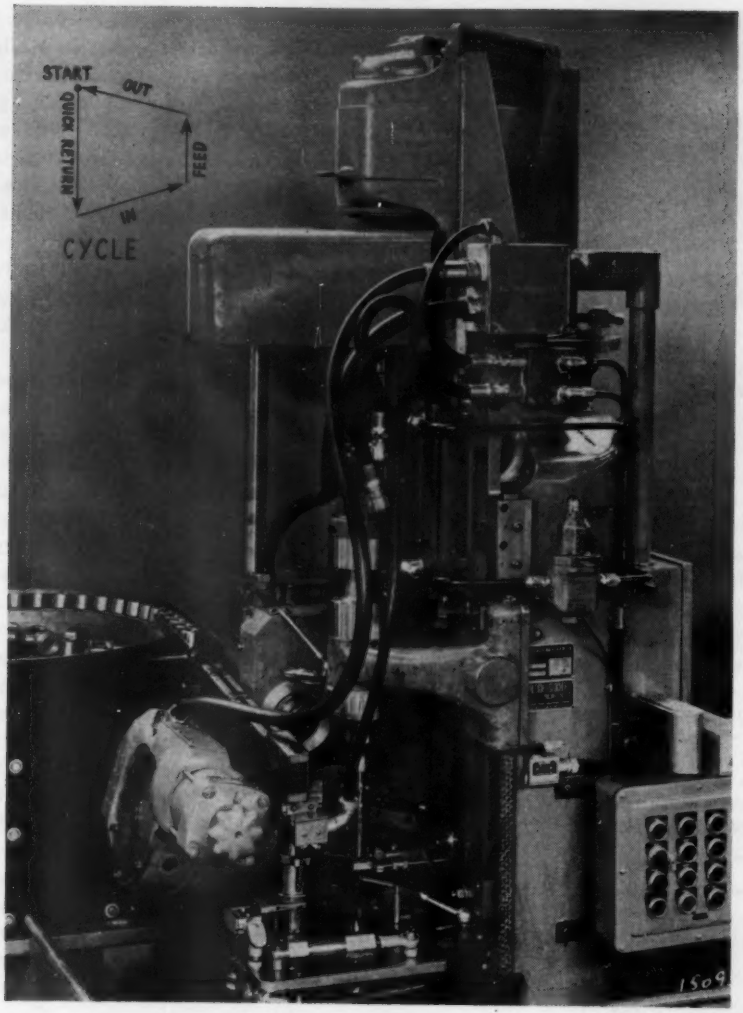
CINCINNATI

The self-resetting hobber . . . continued



American Machinist

Feeding . . .
a Lees-Bradner Model 7, Type A hobber equipped with "Automotion" is done by the Syntron vibrating-hopper unit mounted at left behind the 3-in.-hob shifter on hob head. Blanks pass through an inclined chute to a turnover unit, where they are turned at right angles so they can be loaded, two at a time, with axes vertical, through a magazine tube into pivoted spring-loaded jaws on the outer end of the transfer arm below. The Syntron, started only when the hob is not in the work, feeds blanks up to a fixed number, then stops. The machine is interlocked so it will not cycle unless enough blanks are in the tube. Machine cycle is diagrammed at upper left

Now "Show Year" brings . . .

THE SELF-RESETTING HOBBER

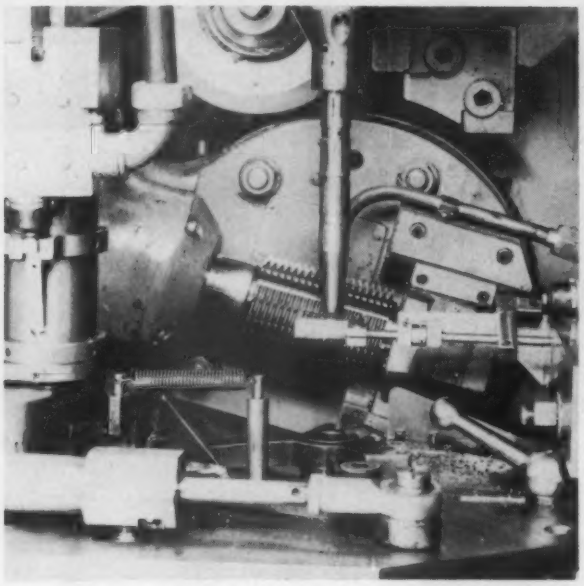
FRED W SINRAM, LEES-BRADNER COMPANY, CLEVELAND 11

Automation becomes "automotion" with addition of a gear-inspection unit that can go beyond gaging to change PD, advance the hob, and sort the product. What's more, these functions can be combined with a "memory" so the vagrant chip doesn't cause a reset—or only the out-of-tolerance tool is reset on a multihead machine

Hobbing machines have been built which automatically load and unload parts, and also check gears on pitch diameter. Now, a machine has been built and tested which will not only automatically load and unload, but by means of a checker and feedback, adjust PD control and shift the hob.

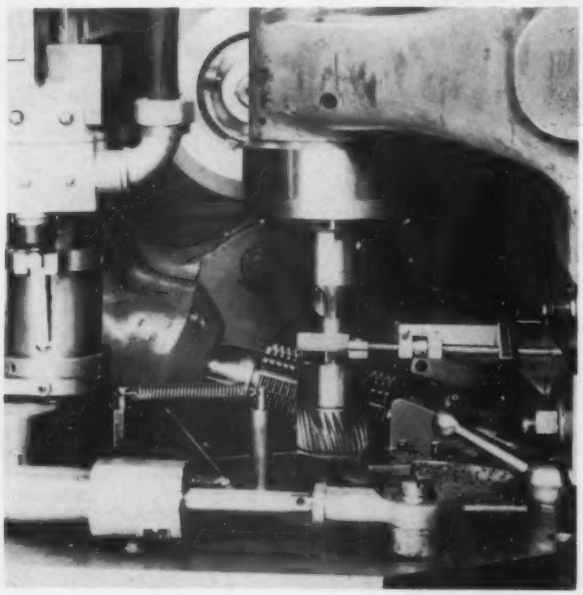
When "automation" was first considered, we decided to call in an electronic manufacturer who recently had developed a cell counter for cancer research. We reasoned that ability to produce such a device suggested the ability to produce a checker for a hobber. This proved correct—and the checking device is described in the succeeding article.

The combination of design elements on the Lees-Bradner vertical production gear hobber provided the basis for this development. The closed cycle lends itself to simple uncomplicated equipment



Closeup . . .

at start of cycle shows tailstock (center) up and expanding mandrel exposed, with the stripper below it. Pitch-control compensator is behind and to left of tailstock. Transfer-arm actuating cylinder (foreground) is mounted on the loading platform, which may be swiveled to left (and stripper right) out of the way when hobs are changed. To start the cycle, the transfer arm moves two blanks from the loading tube at left to a positive stop at center. Tailstock moves down to carry mandrel sleeves into bores, then the mandrel is moved hydraulically to bring its lower end into engagement with the drive bushing in the work spindle



During hobbing . . .

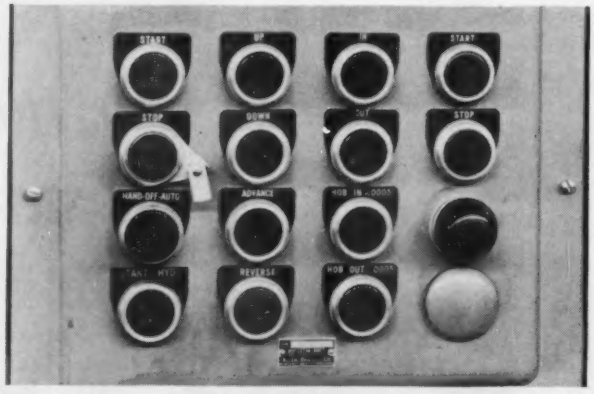
blanks being hobbed are firmly held by clamping on faces and the expanding mandrel in the bore, and driven by faces and tapered tailstock mandrel in the work spindle. Transfer arm is at left, ready for reloading. Some final loading movements occur during rapid return of the hob slide, so total cycle time is cut. When hobbing is complete, hob backs out, mandrel sleeves collapse, and the tailstock moves up to clear. Swing of the transfer arm with new blanks pushes just-hobbed gears into a leadaway chute to the checker. Safety devices are built into the movements so, if one should fail, the cutting cycle will not start

for automatic loading and unloading. Also, the hobbing cycle is roughly rectilinear. The hob slide is moved in and out with an in-out mechanism that brings the hob mechanically into full depth against a positive micrometer stop. Being able, electrically, to reposition this stop makes it possible first, to receive a signal, and second, to translate the signal by positioning this stop in accordance with the signal received.

Positioning of this stop is obtained through two solenoids, a ratchet and a pawl. The minimum increment of adjustment is 0.00025 in. on the radius, or 0.0005 in. on the PD.

The second function which allows utilization of the electronic checker is the electric, intermittent-type hob-shifting mechanism. (The automatic cycle on the machine is sketched on the first photo.) Regardless of when the checker signals the machine to shift the hob, the shift will not be made until the completion of a cycle. Actually, the machine tells the checker when it can use the signal. Thus, hob shift takes place only between the end of one cycle and the beginning of the next.

Tolerances for PD set up on the checker are less than those allowed on the print. Gears, beyond the tolerances of the checker, but inside print tolerances, are not rejected, but pass on as good gears. However, because they are out of checker tolerances, they will signal adjustment to the hobber after a predetermined number have passed through the checker. This signal will bring the hob either in or out. If a predetermined number of out-of-tolerance gears continue to come through the checker and setting cannot be corrected by adjusting the hobber, the machine will be stopped by the checker. How-



All functions are automatic . . .

when machine is started. Depth of cut has been previously set by hand buttons at 0.0005 in. in or out. Control station has start and stop buttons for auto cycle at upper left. Selector switch below gives hand or automatic cycle or off. At lower left is the hydraulic motor switch. In the second line (all hand-cycle controls for setting up machine) are up and down switches for hob, advance for hob shifter, reverse to return hob to starting position. In the third line are in and out buttons for hob, hob movement in or out 0.0005 in. for PD control. In the fourth line are Syntron start and stop buttons, plus a red light to signal stop of machine because hob is beyond last thread. Selector switch above panel is for PD control by hand; PD is normally set automatically under checker control

ever, the checker will retain the signal which caused it to stop the machine, thus showing the operator why it was stopped.

At the second position, checking for root-fillet growth, the checker decides when the hob should be shifted. Again, after a predetermined number of gears have shown growth, the checker will signal the hobber to shift the hob and bring new cutting edges into action. The checker forecasts, resulting in a hob shift, thus avoiding excessive hob breakdown. This results in much more uniform hob wear and less grinding-back of teeth during sharpening.

With this setup, when a new hob is used, in its original setting, it produces well over 100 gears before root-fillet growth was measurable. As the hob shifter utilizes an increment-type shift, and shift is to the next tooth on the lead of the hob when shifting out of first position, some teeth that have been working on the previous setting are still hobbing on the second setting. Because of this, the number of pieces produced by the hob was greater than could be produced by shifting just on a predetermined number of pieces. At completion of the shifting of the hob across its face, the machine automatically shuts off and the machine cannot be run again until the hob is changed and the hob arbor is electrically retracted to its original position.

MULTI-SPINDLE "AUTOMOTION"

A 6-spindle, Model 7, Type A, vertical production hobbing machine can be similarly operated for the same reasons. A multiple-spindle Lees-Bradner hobber actually consists of 4, 6 or 8 separate machines mounted on a rotating base. Each spindle has its own complement of drive motors and controls. While the Rotary is normally in constant rotation, it has been necessary to change *constant* rotation to *hesitation* rotation in order to load and unload. Each spindle actually comes to a stop to allow the common loading device both to load and to unload the work. However, during this hesitation time, the balance of the spindles are still running and hobbing.

It was also necessary, when going to a rotary machine, to change the type of loader. On this machine, a straight shuttle-type loader and unloader is used. This loader moves straight in, picks up the finished blank, indexes the holding section, deposits a new blank, retracts to the starting position and discharges the finished gear into a chute which will convey it into the checker.

This checker, while performing all operations described for the single-spindle unit, must also have retention powers for all spindles involved. Therefore, there is built into this checker a memory which will retain the result it has checked from each of the various spindles until that spindle returns to the loading and unloading station. At that time only will the checker feed the impulse to that spindle to correct the PD or shift the hob.

Using a rotary-type hobbing machine has its limitations. Where cycle times are extremely short, it becomes necessary to go to the single-spindle type "Automotion." Speeding up and slowing down a unit weighing from 30,000 to 50,000 lb in an extremely short cycle time becomes quite a problem. It appears that if a rotary is required on an extremely short cycle time, it would be preferable to have two loading and unloading stations, 180° apart. The part would then be finished in 180°, therefore allow rotation time double that required to finish the part.

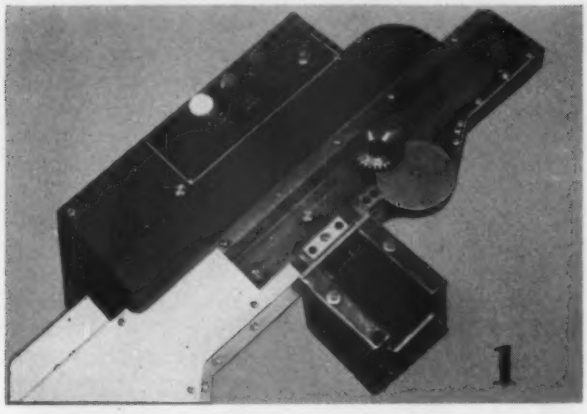
Robot inspector controls hobber

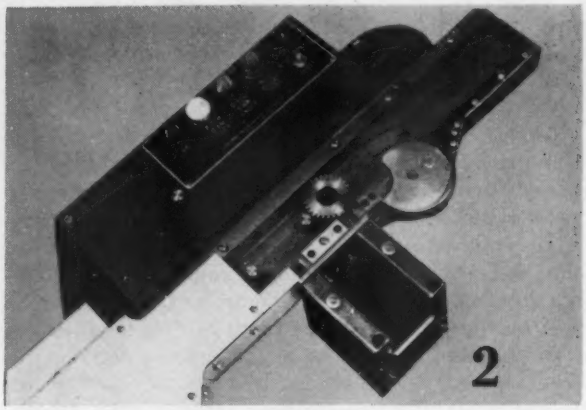
Electronic plug-in unit sorts gears and signals changes, based on measurements of PD and root-fillet buildup. Latter shifts hob. Two sets of tolerances, one within the other, are used. Outer limits control sorting gear by gear, but inner limits "foresee" drift out of tolerance and correct before it happens. Multiple spindles can be controlled

RAYMOND C MILES,
AIRBORNE INSTRUMENTS LABORATORY, INC, MINEOLA, N Y

In these days of high production rates, an automatic hobbing machine in need of adjustment can produce a lot of scrap before the trouble is discovered. Errors in pitch diameter, for example, can pass unnoticed by the operator. Frequently, hours may pass between the time a hobbing machine begins making bad gears and the time the first of these gears shows up at inspection. Meanwhile, the hobber has turned out scrap.

The problem becomes even more serious when gears from several hobbing machines are intermingled by the time they reach inspection. Then the complete lot must either





Sequence of mechanical operations . . .

as a gear passes through the feed and handling unit: 1. Gear about to leave gate wheel and roll to first measuring position. 2. Gear in first measuring position, where it is being checked for PD. 3. Gear has passed on to second measuring position and is

be scrapped or given 100% inspection, and tedious investigation is necessary to identify one machine as the culprit.

The solution is to inspect the gears at the hobbers. To keep up with the high production rates, as well as for other reasons, automatic inspection equipment is required.

Inspection that merely sorts the gears as good or bad, however, doesn't solve the real problem, which is to prevent the hobbing machine from making bad gears in the first place. Automatic gaging equipment that will shut down the machine if it makes too many bad gears is a step in the right direction, but there is still the loss of valuable production time while waiting for necessary readjustments.

A complete solution requires inspection equipment capable not only of sorting gears, but also of making any necessary adjustments to the hobbing machine.

The AIL gaging and control equipment combines mechanical and electrical operations to check gears for both pitch diameter and root-fillet buildup. Corrective signals are supplied to the hobbing machine on the basis of these measurements, and gears are also sorted physically.

To minimize time lag between occurrence of an error and correction of the hobbing machine, gears are fed automatically from the work spindle to the inspection equipment, and inspected as soon as received. If a gear is found to be out of tolerance limits, it is automatically rejected as either unsalvageable (too much material removed) or salvageable (not enough material removed). In addition, results of the measurements on each gear are stored in a memory unit, where they are compared with data on previous and subsequent gears to determine whether the hobbing machine is in need of corrective adjustment. When the need for such adjustment shows up, it is performed automatically.

The gear checker makes two measurements on each gear. The first is that of inspecting for pitch diameter. If the gears show a tendency to run outside PD limits, the hobbing machine is automatically corrected.

The second measurement takes place in the root of the tooth space. Although not performed by most automatic gear-checking equipment, such a measurement offers two major advantages. First, it assures that sufficient clearance is maintained for mating gears or for cutters used in subsequent finishing operations, such as shaving. The root-space check is well worthwhile solely in terms of the protection it affords against damage to the shaving cutter, should the cutter be allowed to bottom in a gear not cut deep enough.

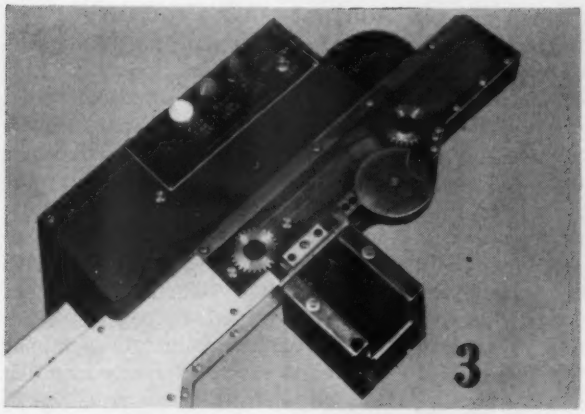
However, the root check offers another important advantage—it provides a very sensitive indication of hob wear, the effects of which show up in the root fillet of the gear long before they can be detected elsewhere. On the basis of this root-space inspection, it becomes possible to control hob shift (to bring fresh cutting edges into action) on the basis of actual wear. Shifting automatically on the basis of *actual* wear makes it possible to realize the maximum life of which the hob is capable, at the same time avoiding the danger of damaging the hob by using it too long after it has begun to dull.

USE OF DUAL TOLERANCE LIMITS

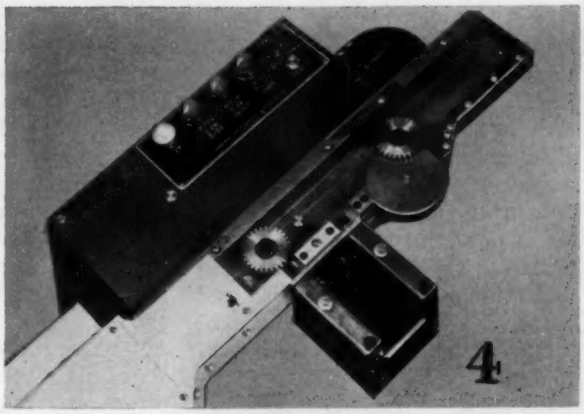
The effectiveness of control is greatly aided by a novel feature of the equipment. *Two sets of tolerance limits are used for each measurement on the gear.*

One set of limits determines whether gears are physically acceptable according to production limits. The second set of limits is narrower than the production tolerance, and is the principal basis for controlling the hobbing machine. This permits the checker to discover potential errors when they begin to occur, and to make necessary corrections before errors become serious enough to result in scrap. In effect, the second set of limits allows the checking equipment to "predict" errors. This facilitates much tighter control.

The narrow tolerance limits are



now being examined for root-fillet buildup. Meanwhile, another gear has entered the feed chute and is awaiting its turn to be checked. 4. Inspection of the first gear has been completed and the gear is about to leave the gage. Note that the indicator lights



have changed from "Pitch Diam Over" to "OK," signifying that the gear is within narrow tolerance limits. The second gear has now been picked up by the gate wheel and is approaching the first measuring position

especially important in root-fillet gaging as a basis for hob shift. The most effective shift procedure is one in which shifting takes place in small steps. The size of the shift increment is such that a single shift does not remove a complete set of cutting edges from action. Although such a shift procedure results in the most even hob wear, it creates special problems in automatic control.

To shift the hob at proper times, the gear checker must be capable of detecting very small amounts of root-fillet buildup, amounts far less than cause the gear to be rejected. Thus, the narrow tolerance limits on root-fillet buildup are used for hob-shift control; the wide limits supply the basis for physical sorting.

CONTROLLING ON BASIS OF TREND

Although the checking equipment is capable of detecting minute differences in gear dimensions, extraneous factors such as chips on the gears, or even normal part-to-part variation, can result in indications that do not truly represent the hobbing machine output. If this problem were not overcome by the checking and control equipment, it could result in needless and undesirable shifting of the hob and readjustment of pitch diameter.

Consequently, control signals are not supplied to the hobbing machine on the basis of measurements on a single gear. Instead, checker electrical circuits determine the *trend* of gear characteristics, and the hobbing machine is then controlled according to this trend. Thus, it is possible to control down to the ultimate limit, which is the repeatability of the hobbing machine itself.

In the case of PD errors, at least three gears must fall outside the narrow tolerance limits before a readjustment. Even if the error is one that becomes progressively worse, it is corrected before any gears fall outside production limits and must be rejected. Physical sorting, of course, is done on a gear-by-gear basis according to the production tolerance limits.

When root-fillet buildup shows signs of hob wear on as few as two gears, the control equipment will shift the hob. If a single small shift does not correct the condition, repeated shifts are made automatically.

DETAILED OPERATION

The gage mechanism operates continuously whenever power is applied to the hobbing machine, performing the purely mechanical functions independently of the presence or absence of a gear in the gage. Actual measurements are made only when a gear is in the gage.

Although capable of handling upwards of 1000 gears an hour, the gage mechanism actually feeds gears at a rate just above the maximum output of the hobbing machine. This avoids unnecessary wear on moving parts, while at the same time preventing accumulation of a backlog of gears between hobbing machine and gage.

Entering the gage from the hobbing machine through a gravity-feed chute, the gear is picked up by a gate wheel and placed in mesh with a thin rack. The gear then rolls down this inclined rack, whose purpose is to provide the necessary tooth-space orientation, until it reaches the first measuring position. Here, it leaves the rack and comes to rest against a retractable stop, at the same time seating on a conical gaging point.

With the gear in this position, a second gaging point enters the tooth space opposite the first, forcing the gear downward against the spring-loaded bottom gaging point. The pin carrying the upper gaging point seats on a fixed anvil, and the position of the bottom gaging point at this time controls output of a gaging sensor.

The gaging sensor is an electrical transformer with a movable core mechanically connected to the bottom gaging point. When the transformer primary is supplied with a voltage, output voltage from the secondary depends on core position. Consequently, this voltage represents the deviation of gear diameter from nominal value. Voltage from the transformer is am-

plified, and controls a set of relays according to whether the gear is above or below each of the tolerance limits.

Both the upper gaging pin and the stop are then retracted, and the gear rolls down into the second measuring position. Operation of the gage at this position is similar to that in the first position, except that the gaging probes are shaped to contact the gear in the root region of the tooth space instead of at the pitch line.

When measurements have been completed in both positions, a solenoid - operated gate opens the proper output chute, and the gear is discharged. At the same time, the results of both PD and root-fillet measurements are entered in the electrical circuits that determine when hobbing-machine adjustments are required.

When measurements on each gear have been completed, a signal light is illuminated to show the status of the gear as OK, PD Oversize, PD Undersize, or Root Fillet Oversize. These signal lights operate from the narrow tolerance limits, and provide a visual indication of small deviations.

If the checker's attempts to correct for observed errors are unsuccessful for some reason, the checker will not continue to adjust the hobbing machine indefinitely. Instead, it will shut the machine down to prevent production of scrap. Should this occur, a signal light notifies the operator.

SETUP PROCEDURE

Setup procedure is extremely simple, requiring no special knowledge or training on the part of setup man or operator. Initial adjustment of the gage is performed by inserting a gear of correct PD, and cut with a sharp hob, into the input chute of the gage. When this gear reaches the first measuring position, a thumb screw is adjusted to establish the nominal PD value for the gage. Correct adjustment is shown by an "electric eye" indicator of the type found in many radios. A similar procedure is repeated in the second measuring position to establish the base value of root-fillet buildup.

Finally, PD and root-fillet tolerances to be maintained are set on directly calibrated dials, similar to a radio tuning control. Both tolerances are continuously adjustable, and the two adjustments are completely independent. If it is desired to change the tolerances at any time, the controls are simply moved to the new values.

Once set up, the equipment will hold adjustment indefinitely, although only a few seconds are required to recheck the adjustment if desired. Setup is the only human attention required; thereafter, gage operation is automatic.

To insure accuracy, the main body of the gear-handling unit is a heavy casting, as are other parts whose dimensional stability affects accuracy of gaging. For the gaging probes, conical points were selected in preference to master gears or racks for two principal reasons: First, the small contact area achieved with conical probes minimizes the chance of error as the result of chips in the gear-tooth space. Contact pressure is sufficient to dislodge small chips unless they are encountered "dead center," while at the same time being light enough to avoid Brinelling of even soft gear stock. Second, PD measurements with probes are free from the effects of helix-angle error.

The gaging sensors, which provide the accurate voltages indicative of gear size, operate without mechanical contact of any kind. Consequently, they are free from the effects of wear, contact corrosion, and other difficulties encountered with switch-type gaging sensors. Accuracy of the gaging sensors is such that the over-all gage achieves an accuracy better than 0.0001 in., which is several times better than necessary from the standpoint of either gear tolerance or tight control of the hobbing machine.

Electrical components are of the best available quality, selected on the basis of experience with such equipment as military radars. Control relays, for example, are of heavy-duty types, and electron tubes used in the measuring circuits are of time-proven varieties which are carried in stock by radio and television repair shops.

MULTIPLE-SPINDLE EQUIPMENT

The gaging and control equipment that has been described is for use with a single-spindle hobber. Equipment for use with multi-spindle hobbing machines operates in a similar manner, but also includes individual control circuits for each spindle. All gears go to a single feed and handling unit, the spindle producing each gear being identified by signals from the hobbing machine. As each gear is measured, results are supplied to the circuits corresponding to the proper spindle, and each spindle of the multi-spindle machine is thus controlled independently.

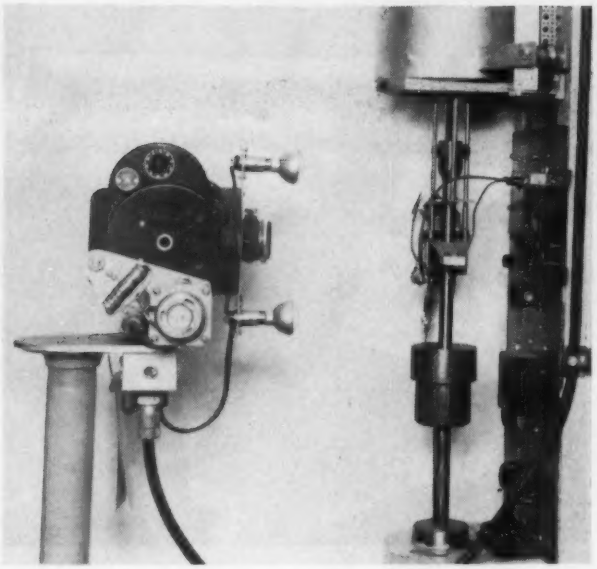
RESULTS OBTAINED

Actual experience in controlling a Lees-Bradner hobbing machine has proved the value of the checking equipment.

It was shown that scrap can be reduced almost to the vanishing point, and that hob life is much better than when following a predetermined program of shifting. In a typical case, the usual conservative basis of shifting after a given number of gears would have resulted in a shift each time 30 gears had been cut. Using the gage to control hob shift, 105 gears were cut before the first shift took place, and examination of the hob showed only the usual amount of wear. Although results may not always be this spectacular, it is apparent that automatic control of pitch diameter and hob shift results in much more efficient gear production, consequently in lower costs per gear produced.

The principles employed for hobbing-machine control are applicable to many other types of machine tools, and work is already in progress on a number of such applications.

For use with existing machinery, the incremental control based on dual tolerance limits is especially convenient. In many cases, this feature of the automatic control equipment makes it possible to use sizing-adjustment mechanisms that are already part of the machines. Thus, little or no modification is required to adapt existing machinery to fully automatic control.



AUTOMATIC CAMERA is operated by a synchronous (clock) motor. Motor serves as timer which is preset to desired interval; actuates relay to turn on floodlights and trigger shutter as well as advance film. Lights are bracket-mounted on camera to form complete, compact record unit. If necessary, stereo attachment can be used to give 3-dimensional record

SAMPLE FRAME from movie record (actually a still photo) shows three instruments, from top to bottom: a strain counter, a clock, and a counter to show total hours. Test description is chalked on black paper in background

AUTOMATIC OBSERVER:

Simple camera setup records while you sleep

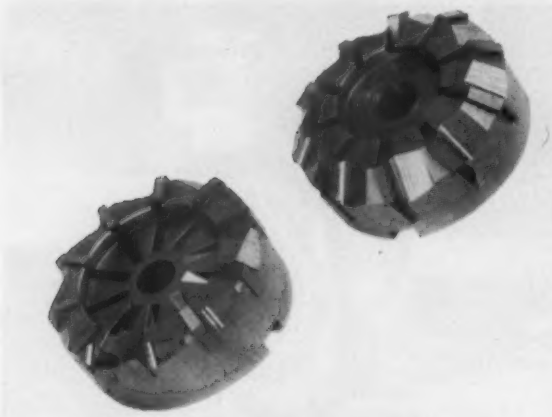
Air Research & Development Command's Wright Air Development Center required engineers around the clock and seven days a week to record test data. Then Bill Rector, Materials Laboratory, worked out this simple automatic system. Results are more precise, record is permanent and complete, and everybody gets more rest. Perhaps the idea will help you solve a problem in continuous recording

Formerly, the method used to record data in creep-rupture testing has been for engineers to read dials and gages at periodic intervals, then record the time of reading and the stress-strain indicators. To provide complete and accurate time-deformation curves, the method required engineers to be on duty 24 hr per day and seven days every week, especially on extended tests.

Utilizing converted, automatically operated movie cameras, the new system photographically records the time, temperature, and strain dials of each testing machine. A converted motion-picture camera is mounted on a pipe stand in front of each machine and focussed on the dials. A timer is preset to operate at any desired interval from 15 sec to 2 hr. At the selected interval, the timer actuates a relay which, in turn, lights two photoflood lamps, triggers the camera's shutter, and advances the film one frame for the next photograph. Thus, all of the necessary test data are continuously recorded.

Ten testing machines have been equipped with this system and more are being equipped. The idea has shown special value in the testing of specimens having a short test life, where creep is accelerated more rapidly because of the higher stresses. Tests which formerly required close continuous attention by an engineer now can be spot checked occasionally and allowed to run to completion without human observation. Then the film record can be studied and the data evaluated with a considerable saving of time. The system should be useful for recording conveyor activity, cutting-tool performance, coolant and lubricant studies, mechanical motion evaluations, fatigue tests, and a variety of other analytical data.

In addition to providing an accurate record of test results, Rector's idea has cut by 75% the number of Air Force man-hr required for each creep-rupture test. Scarce engineering talent is relieved for other duties.



PROTOTYPE 3-IN. MILLING CUTTERS have 10 carbide teeth in powder-metal body. Gripping action of holder on carbide makes use of supplementary braze or clamp unnecessary. Pre-sintered body expands in final sinter, creating almost a fusion grip. Test cut and chips are shown at right

Disposable milling cutters sintered with thin carbide blades in place may cost less than regrinding, provide longer tool life and faster cutting, as . . .

Powder-metal cutters promise new

Powder metal for the body of a milling cutter and the holder of a single-point tool opens up new possibilities in metal removal. When the cutting element of carbide is gripped by the powder-metal body or shank, it affects tool cost, grinding, vibration, tool life, tooth pitch, surface speed, and tool-design flexibility.

The 3-in. cutter shown above has 10 teeth. This will be increased to 14 in the standard line. The powder-metal body is a product of Yale & Towne metal technique, as is the special impregnation designed to hold the carbide blades firmly in place. This patented process holds the cutting elements firmly against any cutting pressure.

The powder metal as it comes from the sintering furnace has a strength of approximately 75,000 psi. A 2-in. cutter of this design has been subjected to a 50-hp cutting load with no evidence of distress in the body or cutting elements.

Recent progress in metal removal can be set down to mechanically held carbide-cutting elements in spite of the high cost of a suitable holding technique. The six surfaces of carbide, wedge, and slot involved in mechanically held carbide must all be held to tolerances of tenths if the cutting element is to be retained effectively. Unless these six sides are flat and parallel, the carbide will not be wedged; it may even be broken in the wedging operation. If the blade is indexable, processing difficulties and costs are multiplied.

TOOL COST

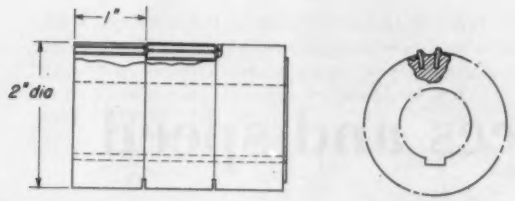
Powder-metal bodies are inexpensively produced despite high mold costs, and carbide blades are gripped in the vise-like jaws of the powder metal wedges without grinding. (In fact, holding of the blades is more effective without grinding.)

A milling cutter with powdered-metal body should cost less than grinding the same size tool of any other design. Not only are the blades expendable, but the body likewise is discarded when the cutting edges are dulled.

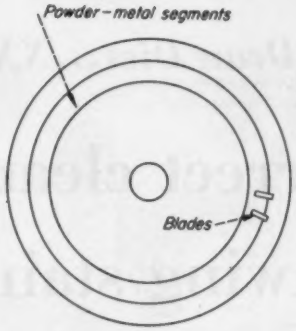
Reduction in blade and tip size makes for reduced cost. When a blade is removing metal, only a small portion of the carbide is effective. The thickness of the chip sets the amount of active carbide; if this is 0.010 in., it represents a normally active cutting edge. The remainder is necessary for holding.

Significantly, both the carbide cutting elements and its holder are the product of a powder-metal technique. The carbide is inserted into a pre-sintered body in which slots and chip clearance have been molded. This insertion is effected with locating gages so accurately as to make unnecessary any subsequent grinding. During the sintering phase—of the body or holder—the expansion that takes place grips the carbide by almost a fusion grip so effectively that the most excessive loading in the cut has been unable to loosen or unseat it.

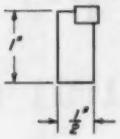
Hardened wedges and bodies necessary with mechanical holding set up violin-string action in the

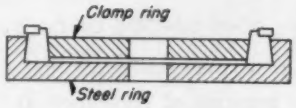


SINTERED SLAB MILL has 2-in. dia, three 1-in.-wide sections of carbide 1/16 x 1/4 x 1 in. Sections are sintered separately with tooth pitch as low as ¼ in. Teeth interlock when sections are assembled

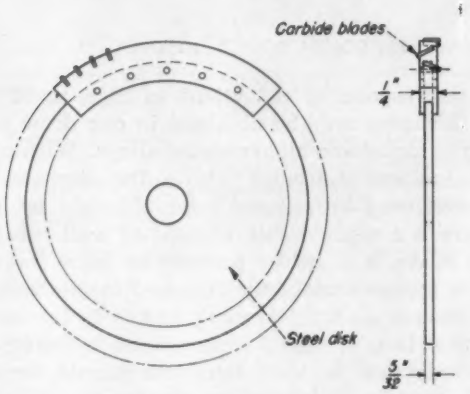


LARGE FACE MILLS can be sintered in segments to mount in a steel holder

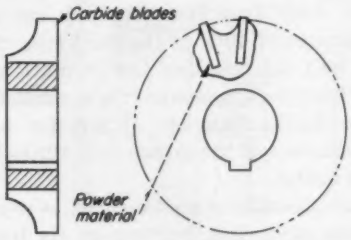




PLUGS FOR SINGLE-POINT TOOLS have small pieces of carbide sintered to powdered metal, eliminating direct clamping of carbide



CARBIDE SAW is made in segments of powder material containing 1/16 x 1/4 x 5/32-in. carbide blades set at 5° negative angle



FORM-CUTTER DESIGN in powdered metal permits same throw-away operation. This design has corner-rounding teeth in powder-metal holder

milling economy

HORACE FROMMELT, U S ENGINEERING & MFG CO, CHICAGO

carbide blade when in the cut. The first and most obvious result of the PM technique is the elimination of vibration. This to the trained eye and ear is immediately evident. The sound of the cut is different; likewise its appearance. The ring and zing are gone and the chips are a silver-white at the customary surface speeds.

The non-crystalline structure, the non-continuous or discrete nature, lets powdered metal act like a dampener for the carbide blade when it enters the cut. Its Young's modulus of elasticity is much higher than steel; that is, it is much stiffer than steel. Hence, its dampening effect.

Although a complete report on cutter life with controlled conditions is not yet available, we have found that tool life is increased roughly three times whether measured by linear inches cut, volume of metal removed, or pieces between grinds.

TOOTH PITCH

This increase in cutting-edge productivity is independent of the decreased tooth pitch (distance from one cutting edge to the next measured along the periphery) or the increase in the number of teeth in a given diameter. A 3-in. cutter of the wedge specification cannot accommodate more than eight blades with the most advanced wedge design.

With a powder-metal body, this 3-in. cutter easily accommodates 16, more if desired. For the same amount of metal to be removed, twice the number of blades can be put to work. The additional cutter life from increased number of blades is added to the increase from the dampened cutting edge. Fortunately, the increased number of teeth is accompanied by an increase in the surface speed at which these blades can be operated. The customary 500 to 700 sfpm for mild steel is increased 100% and more before the chips are the tell-tale straw-blue color. SAE 1020 is regularly run as high as 1500 sfpm. SAE 4140 heat-treated to 300 Bhn is milled at 1000 sfpm and excellent results are obtained in production on a 210 Bhn cast iron when the speed is as high as 500 sfpm. Grade 350 blades 3/32 x 1/4 x 1/2 in. operate as effectively in this cutter design on cast iron as on steel.

The increase in the number of blades per inch of diameter makes it possible to take advantage of these higher speeds. Without an increase in the number of blades, the chip load per blade would be excessively high.

TURNING AND BORING

The same advantages of smaller pieces of carbide to accomplish the same result in cutting is effected in the single-point tool, as in a lathe. In addition, and perhaps equally important, is the elimination of grinding. The surface-to-surface contact when a blade is clamped to a shank or holder is eliminated.

Boring tools in powder-metal holders have the advantage of dampened cutting action.

Cope Talks on Draw Dies...XXIX

Apply correct clearances and speed when drawing stainless

STANLEY R COPE, president, ACME SCHOOL OF DIE DESIGN ENGINEERING, SOUTH BEND 1, INDIANA

In drawing stainless steel, nickel and high-nickel alloys, 1½ to 2 times the amount of clearance allowed for drawing ordinary steel should be used, Fig. 1. For deep drawing of cylindrical shells, an overall clearance of 40% of the thickness of metal is ample and will not result in the formation of wrinkles. With heavy-gage sheets it is a general practice to have the inside diameter of the die ring larger than the diameters of the punch by 3 times the thickness of the metal.

When close tolerances are required, it is possible to iron stainless steel, but because of its tendency to pick up and load the die, it is often preferable to bring accurate diameters to final size by a light machining operation.

With very slight reductions in diameters, (5% or less) corresponding reductions as high as 30% in wall thickness may be obtained in one draw when drawing nickel and higher nickel alloys. With medium reductions of around 12% in diameter, the wall thickness may be reduced approximately by 15%. If there is a considerable amount of wall reduction to be made, it is better practice to draw the shell first to approximately the required inside diameter with little or no wall thinning, and to do the ironing operation last. If a good surface finish is desired, the final reduction in wall thickness should be very slight, merely a burnishing operation. Although pinch trimming is not ordinarily recommended when dies have hard-bronze members, one grade is sufficiently hard for this type of operation. It has proved satisfactory in production for drawing and pinch trimming round stainless-steel shells where the metal does not exceed No. 25 ga. (0.02090 in.) in thickness. Dies are designed like those used for blanking, drawing and pinch trimming ordinary steel. The only differences are that all cutting and drawing details are made of high-carbon, high-chrome steel and that a hard-bronze ring is inserted in the upper die, as shown in Fig. 2. If the shell is shallow, and a few scratches are permitted on the finished work, the bronze part may be eliminated.

SHAVING

Shaving allowances for straight chromium steels should be the same as those used for soft steel. For shaving chrome-nickel stainless steels, nickel, and high-nickel alloys, a more generous cut must be taken to get under the hardened skin. The sheared edges of these materials are work-hardened to such an extent that it is difficult to make a light cut. For this reason the shaving allowances for chrome-nickel steel, nickel, and high-nickel alloys are the same as for shaving hard steel.

BENDING AND FORMING DIES

Plain bending and forming dies are designed in exactly the same manner as for ordinary steel, excepting that they should be larger for greater strength, and have hard-bronze inserts in those parts of the female die over which the metal is formed. Punches and pressure pads may be made of either wear-resistant tool steel, or nickel cast iron.

Because of the resistance of stainless steel, nickel,

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Concluding Instalment

This instalment concludes the series that Mr Cope started in the Aug 3 1953, number.

As long-time readers know, this publication does not normally publish a lengthy series of articles, let alone one that stretches to 29 instalments. There is too much risk of losing readership on the way. But in this case we are glad to report voluminous evidence to support our original judgment that you would welcome each and every instalment as published.

You might like to know how this series came into being. Mr Cope enjoys a world-wide reputation as a teacher of die-design engineering. His courses are based on the *basic principles* of die design, the kind of information hardest to get, the kind you want and we like to publish. After extensive negotiations, Mr Cope agreed to release his material on drawing dies, which is both more extensive and practical than we have seen elsewhere.

From your response, we know that publication of these 29 articles has been a distinct service. Therefore, in concluding the series we would like to thank Mr Cope for his kindness in making an important part of his die-design course available to us, so that we could in turn pass it along to you.
—The Editors

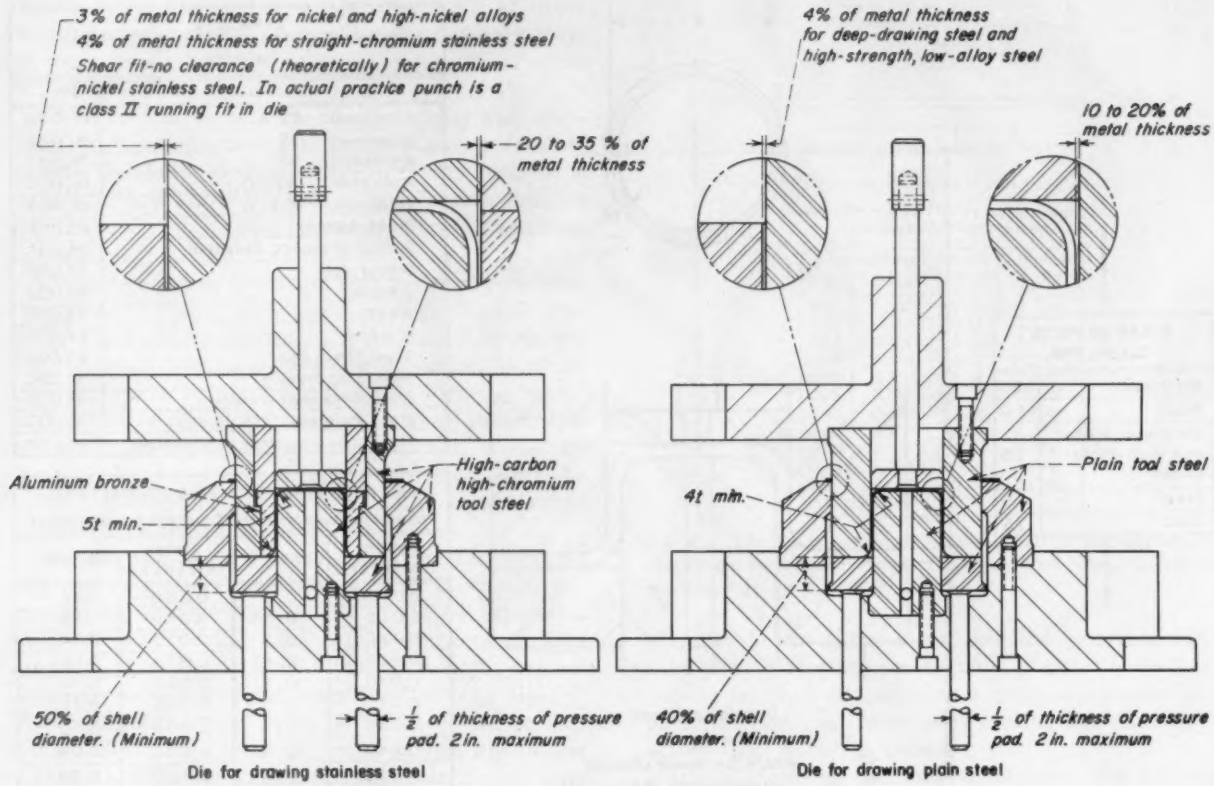

3% of metal thickness for nickel and high-nickel alloys
4% of metal thickness for straight-chromium stainless steel
Shear fit-no clearance (theoretically) for chromium-nickel stainless steel. In actual practice punch is a class II running fit in die
20 to 35 % of metal thickness
Aluminum bronze
5t min.
High-carbon high-chromium tool steel
50% of shell diameter. (Minimum)
½ of thickness of pressure pad. 2 in. maximum
Die for drawing stainless steel
4% of metal thickness for deep-drawing steel and high-strength, low-alloy steel
10 to 20% of metal thickness
Plain tool steel
4t min.
40% of shell diameter. (Minimum)
½ of thickness of pressure pad. 2 in. maximum
Die for drawing plain steel

FIG 1 . . . Clearances for drawing stainless steels, likewise for blanking, require careful attention on the part of the die designer. Comparative allowances for deep-drawing of stainless steel *(left)* and plain steel *(right)* help to clarify the problems involved

and high-nickel alloys to deformation, the allowance made for spring back should be 2 to 3 times greater than that used when bending or forming ordinary steels.

LUBRICANTS

Stainless steel, nickel, and high-nickel alloys are so dense that there is a tendency for the lubricant to be squeezed completely from the sheet, and cause the work to gall against the die. Lubricants with high film strength and low coefficient of friction are required. Light oils and thin soap solutions frequently used on steel and on softer metals are not satisfactory for drawing stainless steel, nickel, and nickel alloys.

For drawing stainless steel, flaxseed soap and water, in proportions of 1 to 3, are used for light operations. For heavier operations use linseed oil and whiting (or white lead and lithopone) mixed together to a fairly thick consistency, after which from 5 to 10% of sulfur is added. The sulfur forms a slight film on the die surface which prevents galling between sheet and die.

For drawing nickel and high-nickel alloys, beef tallow and castor oil are satisfactory lubricants; so also are water-soluble or oil-soluble lubricants compounded in correct balance.

A heavy sulfur-base oil should be used as a lubricant for all cutting operations. Regardless of which

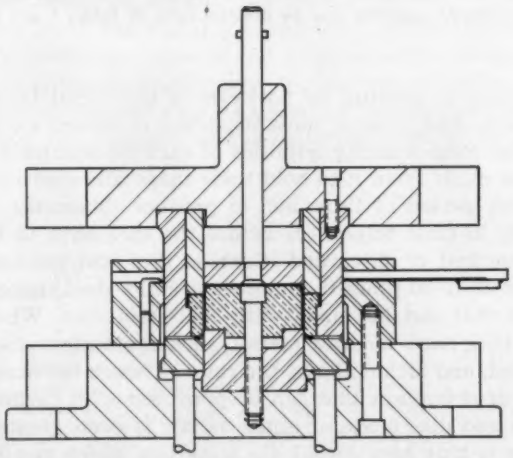


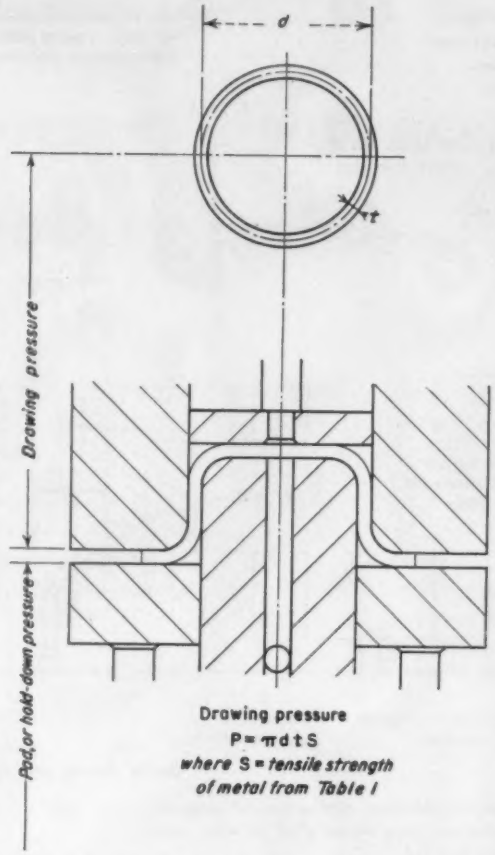
FIG 2 . . . Pinch trimming and drawing of stainelss shells in gages not exceeding No 25 can be done with a die having a hard-bronze ring in the upper die

type lubricant is used, it must be thoroughly removed before the work is annealed or is heated to high temperatures for any purpose.

CEMENTED-CARBIDE DIE PARTS

Several characteristics of cemented carbide make this material ideal for drawing stainless steel, nickel, and nickel alloys. The extreme hardness of the surface, coupled with ability to take and maintain an extremely smooth finish, make carbide practically

SPEED OF PRESS SLIDE, FPM	
Aluminum	100
Brass	150
Stainless, nickel and high-nickel alloys	35
Steel	55
Zinc	75



Drawing pressure
$P = \pi d t S$
where S = tensile strength of metal from Table I

Fig. 3

TABLE I AVERAGE ULTIMATE TENSILE STRENGTH OF METALS	
Metal	Psi
Aluminum 2S-O	13,000
Aluminum 3S-O	16,000
Aluminum 52S-O	29,000
Aluminum 53S-O	16,000
Aluminum 61S-O	18,000
Brass, drawing	46,000
Bronze, phosphor, annealed	55,000
Copper, soft	32,000
Inconel	90,000
Monel	78,000
Nickel	68,000
Steel, Armco iron	45,000
Steel, deep drawing	53,000
Steel, extra deep drawing	48,000
Steel, stainless 18-8	90,000
Steel, stainless, straight chromium	85,000

TABLE II. CONSTANTS FOR HOLD-DOWN PRESSURE*
Pad or Hold-Down Pressure = Constant x Drawing Pressure

Metal thickness	Constant	Metal thickness	Constant
0.010	0.5	0.060	0.16
0.015	0.55	0.065	0.15
0.020	0.5	0.070	0.14
0.025	0.45	0.075	0.13
0.030	0.4	0.080	0.12
0.035	0.35	0.085	0.11
0.040	0.3	0.090	0.10
0.045	0.25	0.095	0.09
0.050	0.2	0.100 & Over	0.08
0.055	0.18		

* *Available pressure on air cushion should exceed figures obtained by above formula by 50 %*

FIG 3 . . . Press speeds for stainless steels and nickel alloys must be less than those for steel, and the holddown pressures must be greater. Refer to Tables 1 and 2 for data to calculate these values

immune to picking up particles of the metal being drawn—the cause of most scratched or scored work.

The long-wearing qualities of carbide enables die parts made from it to hold their shape and size over a long period of time, and to produce thousands of parts to close tolerances before the dies have to be re-worked or discarded. Carbide dies can produce from 20 to 30 times the number of mild-steel stampings that can be made with tool-steel dies. When working hard-to-draw metals, such as stainless steel, nickel, and nickel alloys, the ratio between the number of stampings that can be produced with carbide dies and dies made of other metals is even greater. This is true because all die materials which can be used satisfactorily to draw stainless steel, nickel, and nickel alloys have relatively short lives. This is because of the high pressures necessary to draw these metals without wrinkles.

PRESS SPEED

Because stainless steel requires much higher drawing and hold-down pressures than other metals, contact pressure between the die members and the metal being worked is greatly increased. This condition generates more heat and makes it necessary to use slower press speeds, Fig 3, to avoid excessive pickup, shell breakage, and wear on the dies. When tool steel, nickel cast-iron, or hard alloy bronze are used for drawing-die materials, the press slide should travel between 30 and 40 fpm, depending upon the severity of the operation. When carbide inserts are used, these speeds can be increased 25% because friction is materially reduced and the heat has less effect on carbide parts.

The coefficient of thermal expansion for cemented carbide is about one-half that of tool steel, so a change in temperature affects the dimensions of the die only one-half as much as would be expected from steel. As a result, more accurate stampings can be produced, even though the speed of the press is increased.

Because of the higher drawing speeds, plus the fact that little or no time is lost by the operator in stoning the die (softer die materials often pick up small particles of metal which must be removed at frequent intervals to prevent scoring the work), it is often possible to increase production by as much as 50% with cemented-carbide dies.

In sizing and ironing operations, where the metal is actually reduced in thickness, carbide inserts should always be used for the female die member. It is also advisable to use carbide die rings for necking operations. When forming burrs whose walls are ironed thinner than the metal thickness, carbide male punches (or carbide balls) should be used. Carbide punches are also desirable for performing

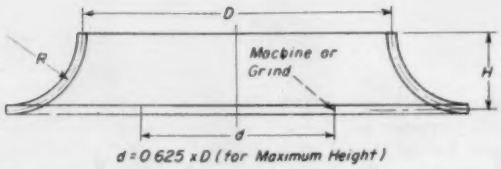
certain types of expanding operations. All of these operations are severe and would cause ordinary tools to wear excessively or become fouled, even after only a few parts have been made.

When carbide inserts are used in sizing and ironing dies, these operations must be run at very slow speeds — 20 to 25 fpm — to hold the heat to a minimum and allow the dies ample time to roll the metal ahead into its new position without fracturing the shell.

Three dies which illustrate how cemented-carbide inserts are applied are shown in Figs 5 to 7. The die in Fig 5 sizes a previously drawn shell by reducing the wall thickness by a few thousandths of an inch. This is a severe operation, because the metal is in intimate contact with the die. More pressure is necessary to make the metal flow than would be required in an ordinary drawing operation. Here the space between the punch and die is considerably greater than the metal thickness.

The die shown in Fig 6 reduces the diameter at one end of a short length of welded tubing. A cemented-carbide die ring is used because the metal in the necked portion of the tube thickens considerably and resists deformation to a high degree. Consequently, the metal hugs the die ring closely. This condition would cause a tool-steel die to gall badly. Moreover, the sharp edge at the top of the tube strikes the die ring in the same place each time and would soon wear a groove in tool steel. Another reason for using carbide in this case is the fact that the welded portion of the tube is very abrasive, and softer die materials would wear rapidly.

The expanding die shown in Fig 7 forces a carbide punch into the tube. This is also a severe operation, because it is largely accomplished by stretching the metal. Much higher pressures are required to stretch stainless steel than to draw it. Contact


D
R
Machine or Grind
H
d
d = 0.625 x D (for Maximum Height)
H = D x Constant (shown in chart below)
Divide the radius (R) by mean diameter of burr (D) find constant

R÷D	Constant	R÷D	Constant
0.00	0.158	0.13	0.202
0.01	0.160	0.14	0.206
0.02	0.162	0.15	0.21
0.03	0.164	0.16	0.214
0.04	0.168	0.17	0.218
0.05	0.172	0.18	0.222
0.06	0.174	0.19	0.226
0.07	0.178	0.20	0.230
0.08	0.182	0.21	0.234
0.09	0.186	0.22	0.238
0.10	0.190	0.23	0.242
0.11	0.194	0.24	0.246
0.12	0.198	0.25	0.25

FIG 4 . . . Maximum height of a normal burr in stainless steel is found from the equation $H = D \times$ constant from table. To find the constant, first divide R by D

pressure between the metal and the punch is considerable. Therefore, a carbide punch is used to reduce friction and eliminate picking up particles of metal and the subsequent fouling that occurs if a tool-steel punch is used.

In all three of the dies illustrated, the contact pressure between the metal being worked and one or more of the die members is very severe. In each case, the resistance the stainless steel offers to deformation tends to squeeze the lubricant from the part and bring the metal into intimate contact with the die. Although some of the lubricant "gets through" and is therefore effective, the success of high-pressure operations such as these are largely dependent upon the hardness of the materials used in the die.

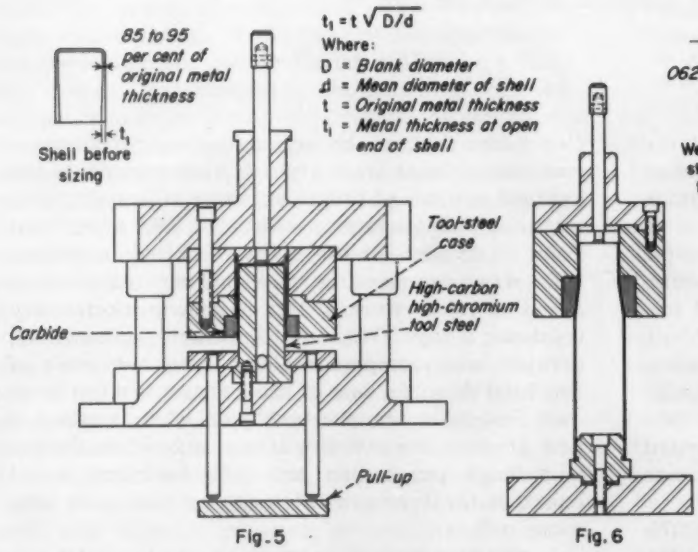


Fig. 5

Fig. 6

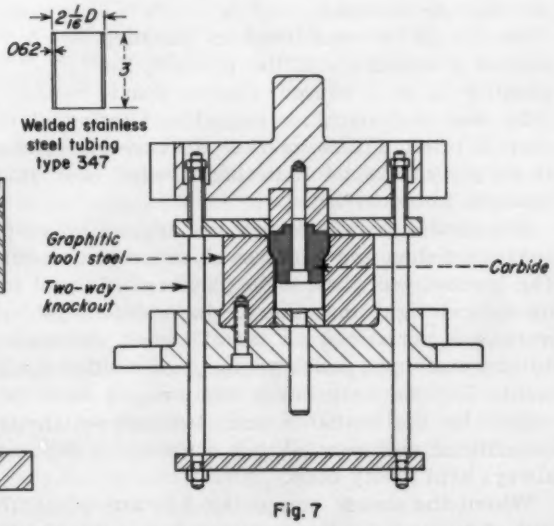


Fig. 7

FIGS 5 to 7 . . . Cemented-carbide inserts may be press fitted or fastened to die and punch members to reduce wear and galling, especially on severe high-production operations. The die in Fig 5 sizes a shell, while that in Fig 6 reduces one end of a welded tube, both operations being severe. A carbide punch is needed for tube expanding, Fig 7, as stretching requires more pressure than drawing

How to control production in a job shop

With three cards and two charts, you can keep a daily record of costs and delivery dates on an endless number of jobs for any number of customers, and do it with a minimum of clerical work

JAMES PEARMAN, superintendent
CAV TOOLS, LTD, HOVE, ENGLAND

In planning a successful organization for a factory, there are many factors to be taken into account. For example, mass production, which would give excellent results where a single product or small range of products was to be produced, would fail absolutely when the products are all different. Obviously, then, there is no universal system that can be applied to every type of plant.

When conditions change, the system of manufacture must change also, or disaster will certainly follow. This is particularly true in a large plant which is still using the system devised for the early days of its product. Output, then, was necessarily small, and outside competition light or, in the case of a patented article, non- existent.

Factors to be considered in planning general procedure are: the product, the quantity to be produced, quality standards, men and machines available, location of the plant in relation to the market, distance from source of supply of special materials needed, and stock material to be carried.

The system described here was devised by me for a contract shop and has proved entirely successful. The product was press tools, plastic molds, jigs, fixtures, and light machinery. In addition, jobbing work was performed on turret lathes, automatics, milling machines, punch presses, and similar equipment. Designs were either our own, or were furnished by the customer and, because we invited the difficult and unusual, our engineering dept was always kept pretty busy.

Where the design was created in our plant, the cost of making the drawings had to be added to the production expense and included in the estimate whereas, in most plants, it is added to the overhead.

ESTIMATE for Drill Jig Date ____

Customer BLANCK Mfg Co Order No. BMC 304

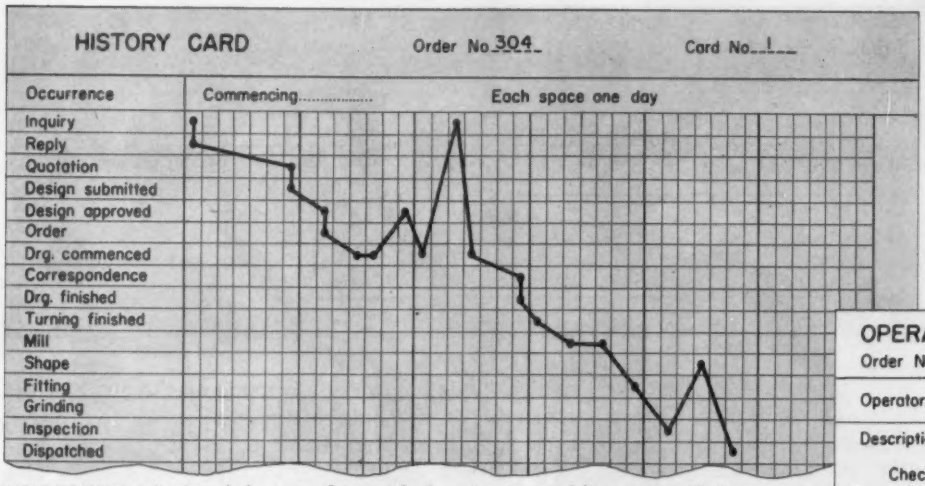
Drawing No. B-509 Sheet No. 1

Operation	Part No.		Grade	Hr.	Rate	Cost
1	1	Shape all over	B	7	1.50	10.50
2	1	Check for square, bore 6 holes	A	8	2.40	19.20
3	2	Turn register (Leave 0.01 for grind)	C	2	1.10	2.20
4	3	Turn and bore 4 bushings	C	4	1.10	4.40
5	4	Mill clamp plates	C	2	1.10	2.20
6	5	Turn sundries	C	11	1.10	12.10
7	2-3	Harden register and bushings	A	1	2.40	2.40
8		Fitting	A	12	2.40	28.80
9	2-3	Grind	A	6	2.40	14.40
10		Inspect				95.70
		Contingencies 5%				4.78
		Overhead 75%				71.78
		Drafting				16.00
		Materials and Pattern + 10%				15.70
						108.26
		Profit 25%				27.07
						136.33
		Delivery 21 days				

ESTIMATE CARD is prepared as first step in obtaining an order. It shows cost estimate and production sequence, labor grade for each operation, plus allowance for contingencies, overhead, and profit

One factor that can be determined only by experience based on at least a year's observations, is the average number of orders obtained in proportion to inquiries and quotations submitted. We found that from 25 to 30% of the quotes resulted in orders. This was important because delivery dates were based on it. In work of this nature, quick delivery is usually a must. Without it, contracts go elsewhere, because most companies which send out work of this kind do so for one of three reasons: when their own resources are overtaxed, or when starting a new product, the overflow is sent out; when the job is a tough proposition and their toolroom is not equipped for it; or as a check against their own toolroom costs.

In the first case, delivery is clearly the most important factor in getting the order. If the estimator assumed that he would get all the work he quoted



HISTORY CARD tells the whole story of each job, from inquiry to delivery. It is filed as a permanent record and is documentary evidence when delays must be explained

OPERATION CARD is completed by operator when each job is finished, and is returned to the foreman with the work. Cards are collected daily, checked, and posted to duplicate production card

OPERATION CARD Date.....
Order No. BMC. 304 Operation NO.2
Operator..... Clock No. 85
Description of operation
Check for square and bore 6 holes
Estimated time 8 hrs | Actual time 7½ hrs

PRODUCTION CARD
Order No. B.M.C. 304 Date.....

Operation	Part No.	Description	Grade	Est. Hours
1	1	Shape all over	B	7
2	1	Check for square and bore 6 holes	A	8
3	2	Turn register + .01 grind	C	2
4	3	Turn and bore 4 bushings	C	4
5	4	Mill clamp plates	C	2
6	5	Turn sundries	C	11
7	2,3	Harden register and bushing	A	1
8		General Fitting	A	12
9	2,3	Grinding	A	6
10		Inspection		
		Delivery by Dec 6th		

PRODUCTION CARD is prepared from the estimate. It is the foreman's record of work to be done and grade of operator to do it. A duplicate of a different color is posted daily with actual costs for use in cost dept

on, and based his delivery promises on that assumption, in all probability he would get no orders at all. If, on the other hand, he makes his promises on the basis of the 25 to 30% average and actually gets 50 to 75%, as is quite possible, someone must be disappointed and promises must be broken.

Under these conditions, any system of organization must be simple and direct, involving as little clerical work as possible, and yet keeping in daily touch with mounting costs, for single jobs have a penchant for running over estimates if not closely watched.

HOW IT WORKS

An inquiry received by mail is opened by the manager and recorded by a stenographer. A copy is sent to the engineering department for preparation of an estimate which, if made to the customer's own drawing, will be sent out the same day, if possible, except in the case of complicated jobs which require more consideration. If the inquiry requires designing the equipment, the draftsman will make a full-size sketch (if practicable), showing the proposed methods and approximate size to guide the estimator. This work cannot be charged for and must be considered as overhead but, without it, guessing may be fatal. It is most important that the nature and difficulty of the work be clearly understood by both contractor and client. Such understanding is not possible unless the latter has something tangible, on paper, showing what he may expect for his money.

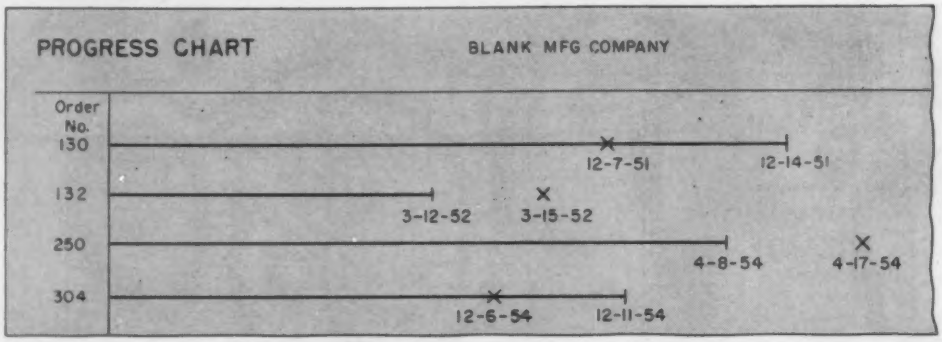
Estimating is the rock on which many jobbing shops founder unless the chief estimator is a man of experience in the particular line. Frequently he must make allowances for contingencies, such as experimental work, and he will be constantly in trouble on this score because the customer naturally wants to get his equipment at the lowest possible cost. Most of them, of course, assume that the contractor's engineers have experience in the whole wide engineering universe.

A standard form is used in preparing the estimate, and when the quotation is sent out the form is put into a folder bearing the customer's name. If the quotation is accepted, the estimate form is used as a basis for preparing the production card for routing the work through the engineering dep't and shop.

If the design is to be made by the contractor, the work is put in hand as soon as work in process permits. Meanwhile, the progress and cost clerk makes out a History Card. This is a valuable tool because, while the job is in progress, snags may be encountered which require correspondence with the client, or the latter may decide to make certain modifications. These can mean delays, and departure from the original delivery date.

With hundreds of jobs going through for many different companies at the same time, details of any one job can easily be forgotten if memory alone is relied upon. Explanations concerning these jobs

American SPECIAL REPORT



PROGRESS CHART shows starting date, required delivery date, and estimated cost for each job for each customer. Daily costs are posted by extending the line. Crossing the estimate mark starts an investigation as to reason for excessive cost

may have to be made at a much later date, so documentary evidence is the best for all concerned. This is the function of the history card.

Once the design is accepted, material is ordered, or requistioned from stock, and a Production Card and individual Operation Cards are prepared and sent to the toolroom foreman, together with the necessary drawings. The production card is, in effect, a copy of the labor portion of the estimate, but without prices. The operation cards specify each particular operation to be performed, and the estimated time. The production card is filed beside the foreman's desk to keep him informed as to how the job has been planned and the delivery date required.

LABOR GRADE SPECIFIED

Both the estimate and production cards carry a column headed "Grade," and the various operations are marked A, B, or C in this column. Grade A indicates that the operation is to be performed by a skilled toolmaker receiving top rate. B operations may be performed by third-or fourth-year apprentices earning not more than two-thirds of top rate, C operations by apprentices getting not more than one-half of the top rate.

Operation cards are colored white for A grade, green for B grade, and pink for C grade. The employee assigned to a particular job fills in his name and number and, when the job is finished, the actual hours spent on it. The cards are returned to the foreman with the finished work and are collected by the cost clerk every morning. They thus form a record of the previous day's activities and give the foreman and the engineering dep't an opportunity of finding out where leakages occur. When estimated times prove to be too short, by general consent, the cards give the estimator a valuable cue.

The cost clerk compares the individual operation cards with the clock cards to see that the full recorded hours are accounted for. When this is found to be correct, the operation is costed in dollars and cents and recorded on a duplicate of the production card, but of a different color, which is retained in the cost dep't as a permanent record of profit or loss.

Daily circulation of this information is vital to all concerned and is achieved by plotting line charts on graph paper. One or more charts may be made for each customer, and a new line is started for each new order on his chart. When the production card is made out, a cross is made on the chart at the spot representing total estimated cost for that order, each square on the chart representing some convenient unit, as $1. Promised delivery date is also shown under the cross. Charts are posted daily with the costs recorded on the duplicate production card and are forwarded to the engineering dept by noon, together with the operation cards. If the line passes the cross, indicating that estimated costs have been exceeded, the job is investigated and, if possible, changes are made to keep costs as close as possible to the estimate.

INSPECTION HOLDS THE KEY

When a job has been completed, it goes to the inspection dept, together with the production card. If the inspector is satisfied, he signs the card and records any allowable minor discrepancies. One of the functions of inspection is to judge discrepancies in relation to the quantity and quality of output from the tool. An inspector who insists on every minor detail being 100% satisfactory can hold up production and make costs mount prodigiously. Admittedly, this is a highly debatable point for, if inspection is too lax, quality goes down, interchangeability suffers, and endless trouble ensues from the assembly dept. The inspector, to judge the happy medium, must have a thorough knowledge of toolmaking and be well versed in the function of the components the tool is designed to produce.

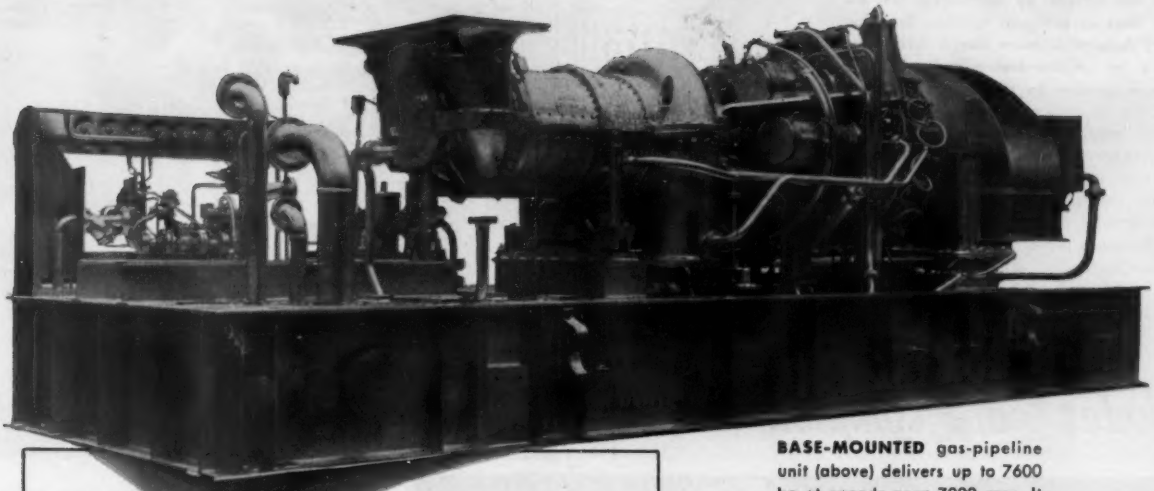
This is rendered more difficult in the contract shop because, except for a few trial pieces made with the tool, actual production may be performed in a plant from 5 to 5000 miles away, where the atmosphere may not be exactly friendly.

This unfriendly feeling may be caused by management's insistence on the tools being made outside, and the shop's hostility to such a policy. Awkward situations have been caused by irresponsible persons interfering in spheres in which their experience is limited. In the case of the contract shop, the chief inspector should send his reports and be responsible only to his own works manager. He should be quite independent of, but not hostile to, the tool engineer.

The system is cheap to operate and can be used with success in any toolroom for keeping down costs. One of its chief virtues is that it insures complete coordination between all departments.

American Machinist SPECIAL REPORT NUMBER 395

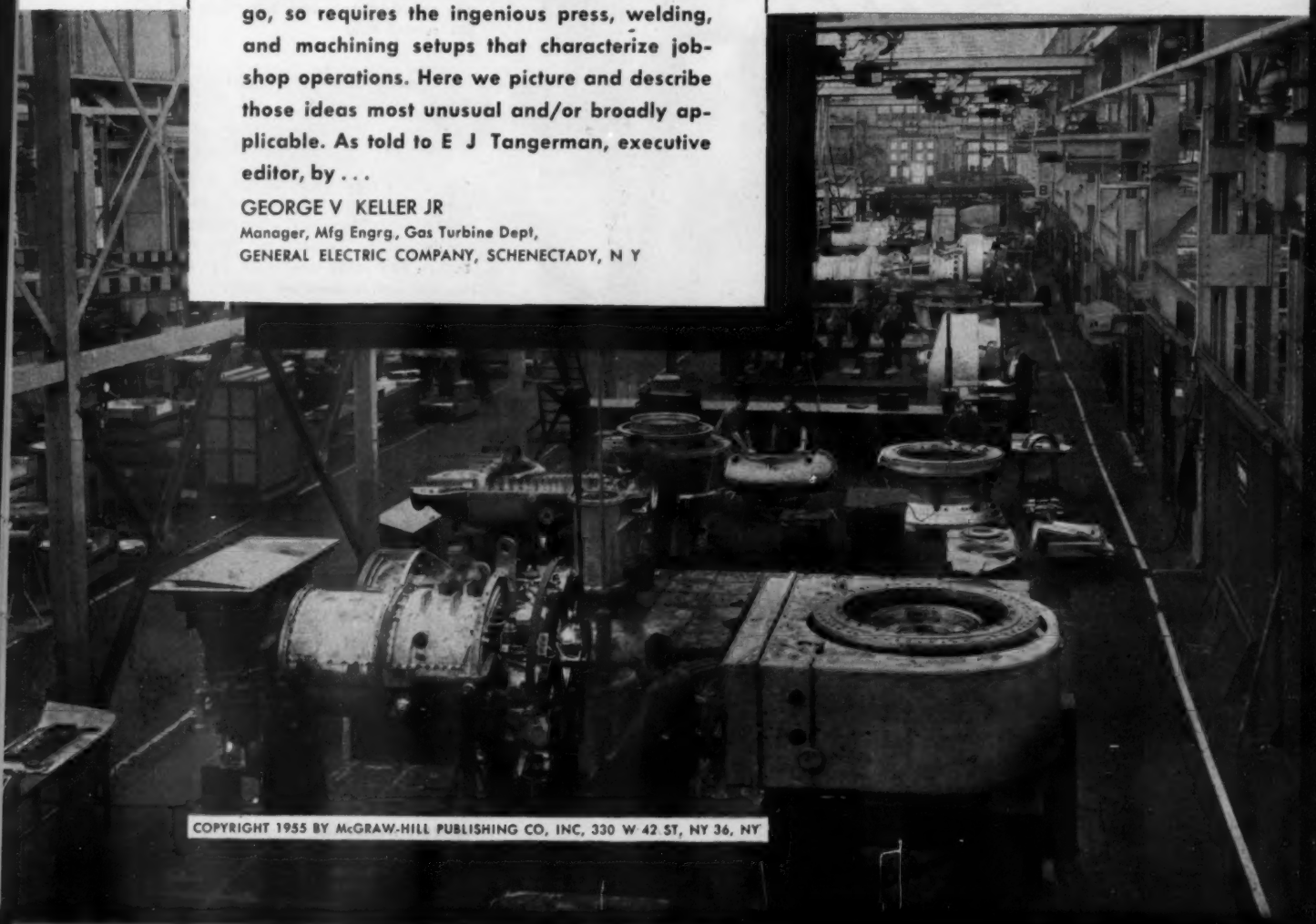
How GE makes gas turbines



BASE-MOUNTED gas-pipeline unit (above) delivers up to 7600 hp at speeds near 7000 rpm. It requires only electrical and piping connections. Long-life gas turbines are bulky, but small compared to other complete power plants, so the assembly area must be large, as shown below

Over a hundred GE gas-turbine installations on pipelines and in industrial plants, including 25 railroad locomotives, are now operated by GE gas turbines. Such a number, large by gas-turbine standards, is still small as production quantities go, so requires the ingenious press, welding, and machining setups that characterize job-shop operations. Here we picture and describe those ideas most unusual and/or broadly applicable. As told to E J Tangerman, executive editor, by . . .

GEORGE V KELLER JR
Manager, Mfg Engrg, Gas Turbine Dept,
GENERAL ELECTRIC COMPANY, SCHENECTADY, N Y



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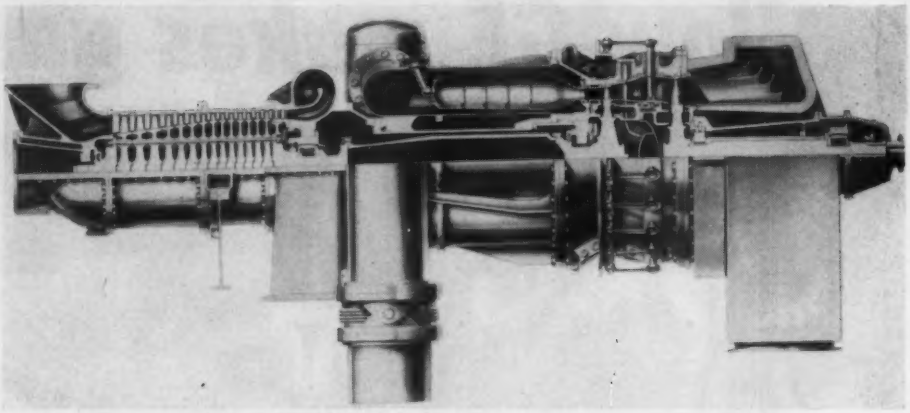
First, let's look at the product, to see the problems...

Essentially, a gas turbine takes in air, compresses and heats it, then feeds it into combustion chambers where fuel is added and fired. The resulting "gas" drives the turbine by expanding just as steam does in a steam turbine. The stationary turbine is more like a turboprop than a jet engine for aircraft, in that power is applied to the output shaft at right. Air is drawn into the compressor at left, compressed, and sent through the combustion chambers surrounding the turbine at right. They discharge into the turbine, and exhaust products flow outward through a heat exchanger to preheat incoming fresh air. Fuel is kerosene, distillate, or gas. Efficiency is slightly lower than that of a diesel, but operation is simpler and maintenance less.

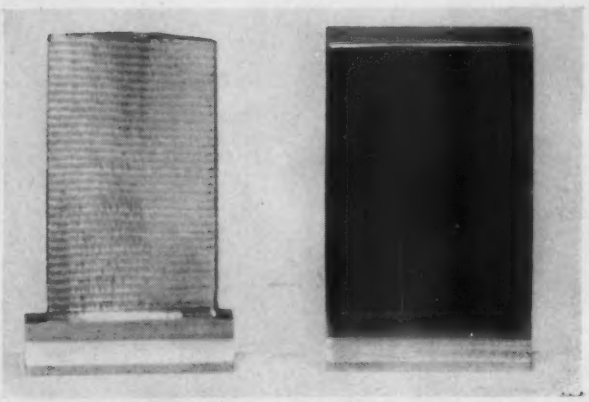


Blades* are complex shapes, which must be exact...

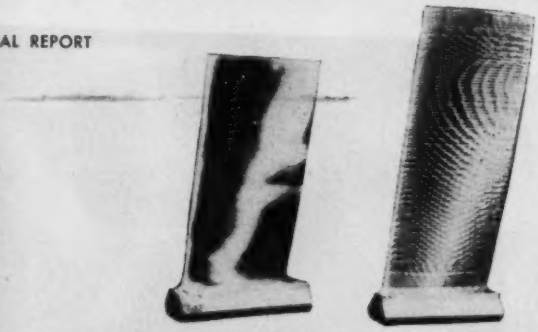
Inclined ...

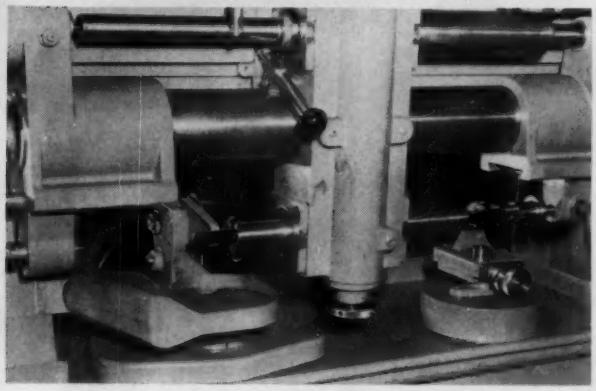
6-spindle Cincinnati Hydrotels—the first of their type—mill the desired shape on buckets and blades. Cycle time is about 3 min for the average blade. Milling cutters are carbide-tipped, and sulfur-base oil is the cutting fluid

* In gas-turbine lingo, blades go in the compressor only. The turbine rotor is toothed with "buckets," while the turbine nozzle carries "vanes" or "partitions." Buckets and vanes must resist high heats, so are high-temperature stainless steel, usually S816 or S590 for buckets, and 25-20 for vanes



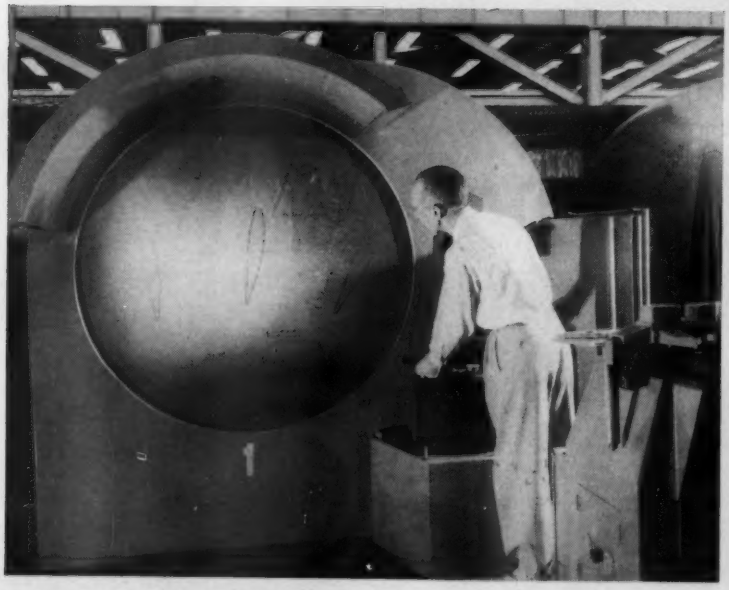
OLD METHOD NEW METHOD





Blades are polished . . .

on a special Pratt & Whitney belt polisher involving four different cam motions. Left-hand cam at top (general view) controls rotational speed of work, to give an approximately constant rate of metal removal. Then central cam (closeup) rotates a yoke that carries the abrasive belt and motor drive, to make sure plane of belt is always at right angles to the surface being ground, thus avoiding grinding steps or notches. Third cam (far right) moves the entire work mount back and forth axially to clear the belt when grinding near the root. Belt path is not necessarily square with root shoulder, so the belt might readily drag at some points, grind in sufficiently close at others if this were not done. The final cam is the direct shape control—traced on a mount like that of the work and directly beside it. There are six of these machines on a common hydraulic system. Belts are 80- to 100-grit, and Esso 2123 oil (80%) with Metaloid X60 (20%) is the cutting fluid. Cycle time per blade is about 6 minutes



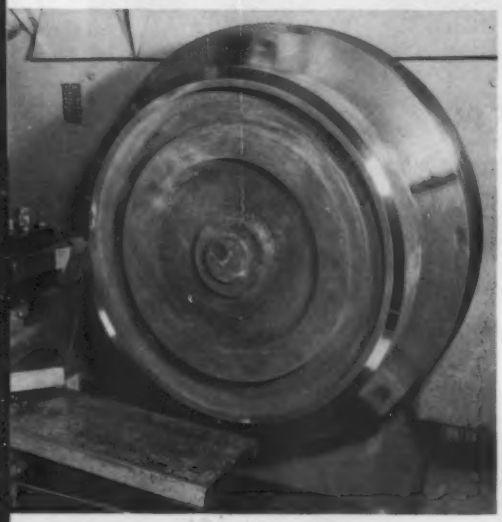
Contour of blade-airfoil section . . .

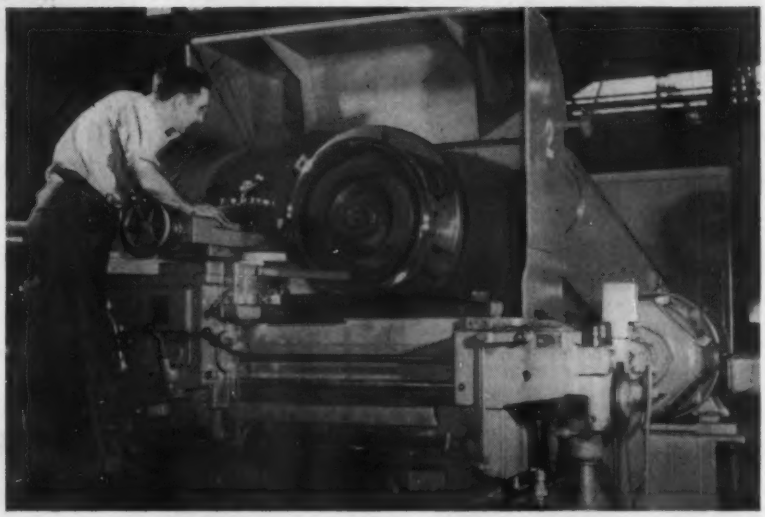
is carefully checked at three levels in this Panto-Scriber. The blade is mounted by its root in the fixture at right (closeup with man). Two sensing fingers on cross-arms pass over it, guiding diamond-tip cutters which scribe continuous circles on the green gelatine surface of a glass plate. Passes over three fixed sections create three scribed patterns side by side in a fixed relationship. This plate can then be projected at 20 to 1 on the giant screen at left and compared with master images. Maximum tolerance is shown by a heavy black line, minimum by blocks along the line inside it. By rotating the plate 90°, blade shapes can also be checked for camber

OLD METHOD NEW METHOD

Here is a new idea . . .
in producing blade blanks—making the blade from rectangular bar, upsetting it to provide heavier root, then twisting to shape. Upset and twisted blank requires only 2.6 lb of Type 403 (12% Cr) instead of the 6.2 lb required for the rectangular bar. Labor and other costs are about the same as before, but the material saved represents a substantial amount

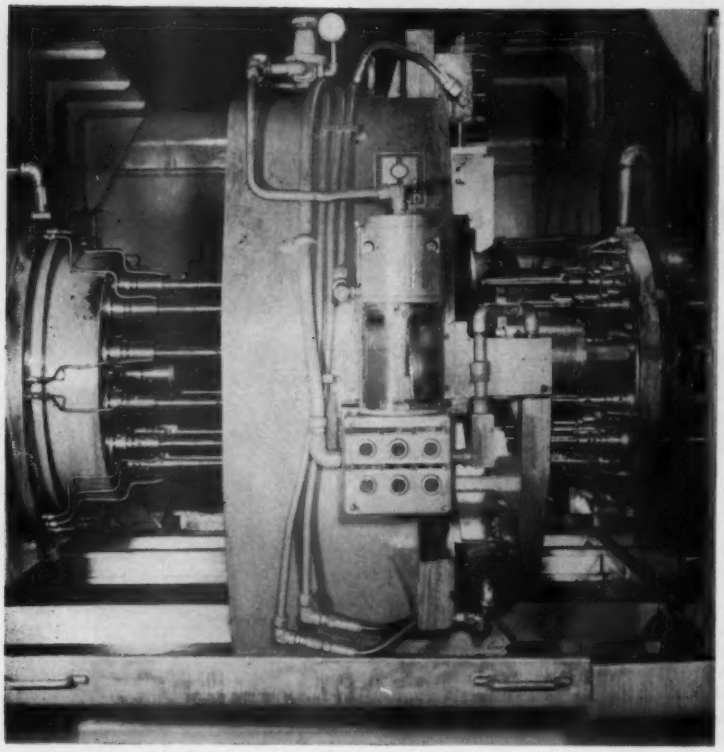
Blades are held in the forged compressor wheel...

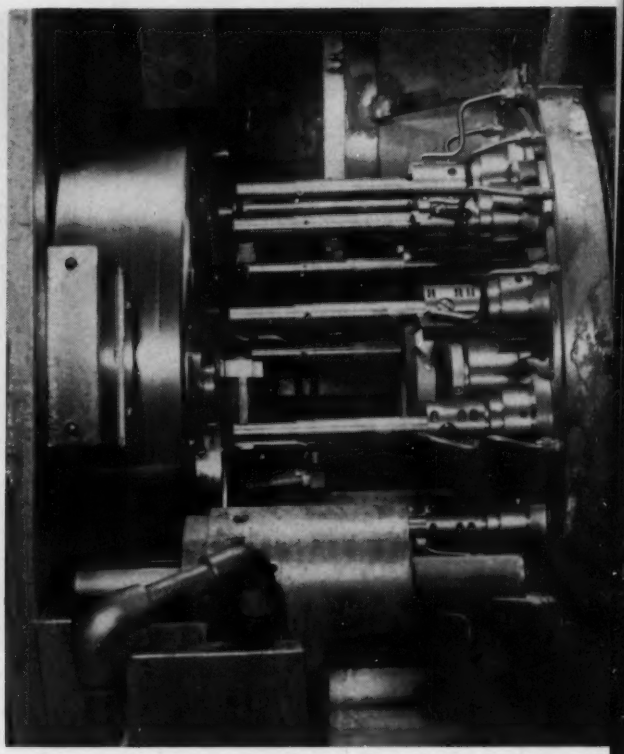




Compressor wheels . . .
are machined from 4340-type steel forgings in a Lodge & Shipley T-lathe in 1½ to 2 hr per side. The lathe tool is contour-guided by flat templet (left). Cimcool is the cutting fluid; surface speed is held constant automatically at 400 fpm

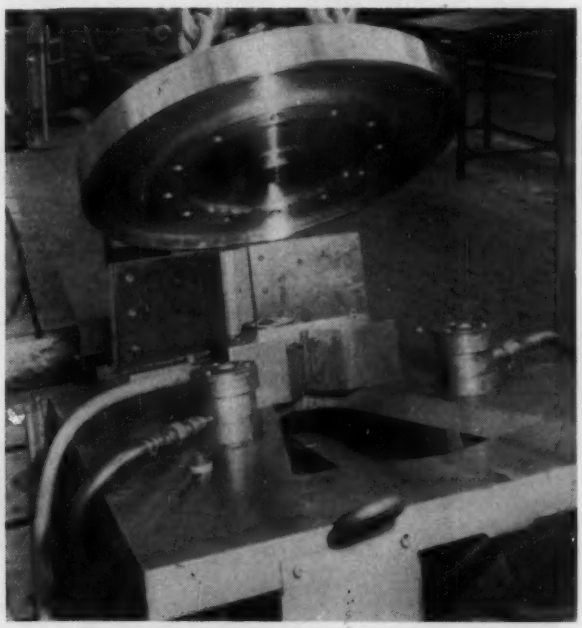
Tie-bolt holes . . .
are drilled in a 12-spindle Barnes multi-drill, then the bolt-circle diameter is ground in an Arter grinder (shown). This diameter establishes concentricity of the finished rotor, so must be exact. Tolerance for thickness is 0.0003 in.





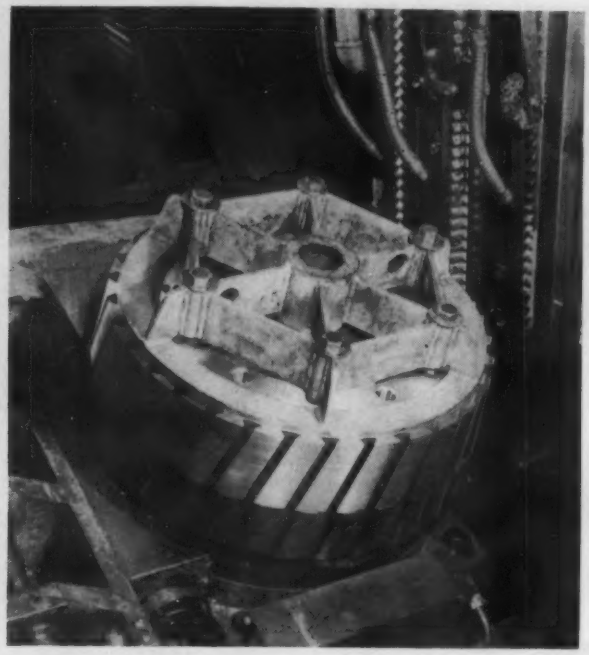
Wheel tie-bolt holes . . .

are bored in this 4-head model 522 Heald Borematic. Two opposed heads handle one diameter of bolt circle, the other two another, and the central fixture can be slid back and forth to suit. One head roughs holes and puts on a radius, also finishes female hub rabbet; then the fixture crosses to other head which finishes holes, radiuses other edge, and finishes male hub rabbet. Holes must be held concentric with the hub (rabbet fits) within 0.0003 in. total tolerance and 0.001 with relation to each other. Diameter tolerance is 0.001 in. total. Tools are carbide tipped. Quills have built-in vibration dampeners



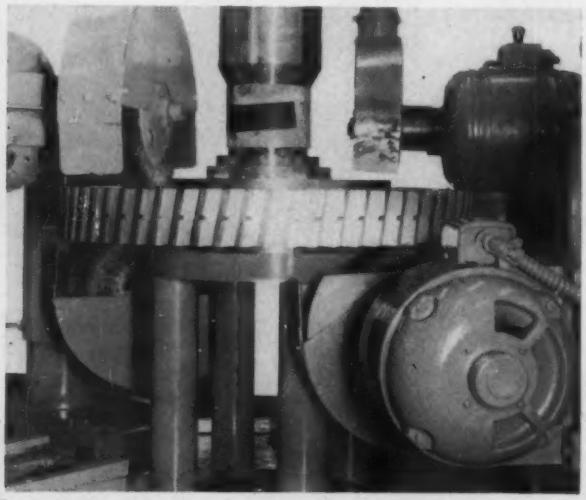
Checking fixture . . .

(for Heald) determines concentricity of male and female rabbets on hub. It is GE built, and the third method tried. The wheel rests, male rabbet down, on three bearing balls floating on air, with the male rabbet set in a hardened tool-steel V. Then a dial indicator checks female rabbet for concentricity. Runout of outside diameter is also checked on this fixture. Large upper V at lower end is merely a safety stop because wheel weighs 150 lb. Note support balls in cylinders in right-hand photo



Compressor-wheel . . .

(and turbine-rotor) dovetails are broached in a LaPointe 90-in.-stroke vertical 15-ton machine. Wheels are held in an automatic-indexing fixture, adjustable on trunnions for compound angles. Fixture is located in front of left-hand broach, indexes automatically to rough all dovetails (about 80 in compressor wheel, 100 in turbine rotor). It is then hand indexed across to right-hand tool for intermediate cutting cycle, and finally to center for finishing. Cycle time is 1¾ hr for a wheel. Note that broach is set in a pit, so fixture is at low working level, and that chips are lifted out by conveyor in foreground (left picture). Lubricant is Vantrol 5495A & 5495X in equal parts. Fixture shown in closeup above is of automatic-indexing type

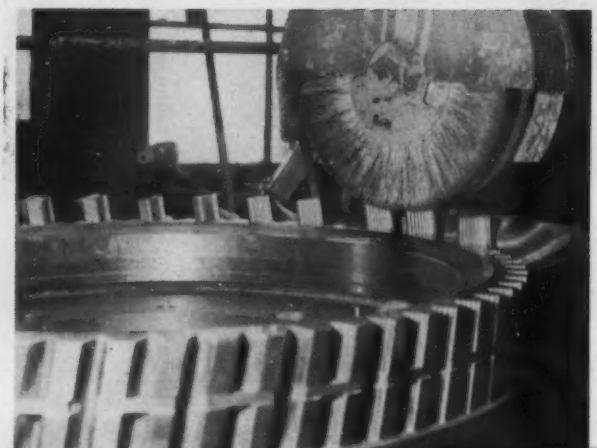


Dovetail corners . . .

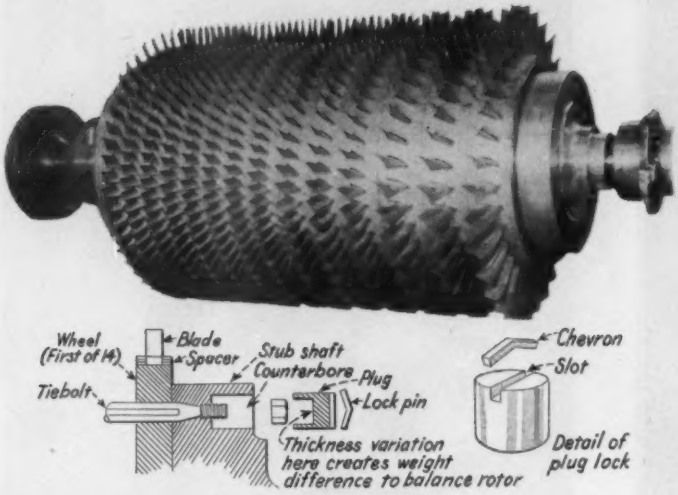
could create stress concentrations, so must be radiused. This was first done by a portable tool, but is now done on a GE-built radius-polishing machine utilizing four motor-driven tampico brushes, two on top, and two below the wheel. Brushes are fed with Nu-Spra-Glu S-390 (Siefen Co, Detroit) liquid abrasive. Cycle time is about 30 min. Closeup (above right) shows turbine rotor being radiused

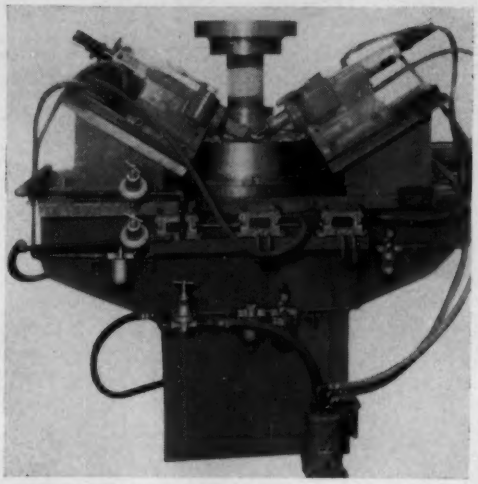
Bucket dovetails . . .

are also radiused in the same machine by setting a dummy rim carrying slots into which buckets are set to about half depth. In this case, only the upper two brushes are used. Cycle time is roughly an hour for a set of 96 buckets (both ends)



Several other rotor components require unusual operations





Stub shafts . . .

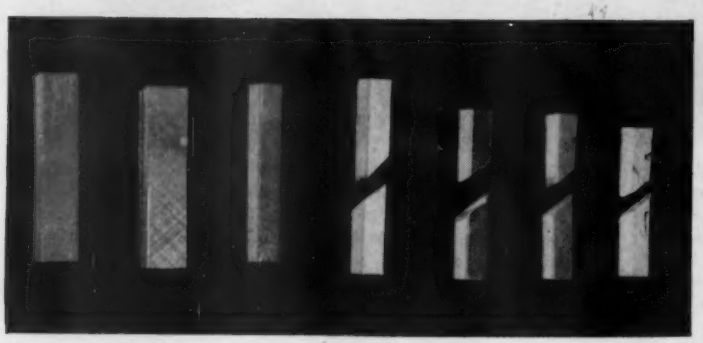
go on ends of the nested wheels and are tied in by through-bolts. Nuts are set in counterbores, plugged on top to lock them and present a smooth surface. Plugs (really shells) also are of varying weights so rotor can be dynamically balanced at the same time. Plugs are held in by a small-diameter pin through a top slot entering holes in side walls of counterbore. Pin is originally chevron-shaped, is set in slot, then straightened out and staked in for locking. Holes for the locking pin are drilled in this special angle drill, which has two hydraulic spindles that cross each other to drill opposite walls of each counterbore in turn

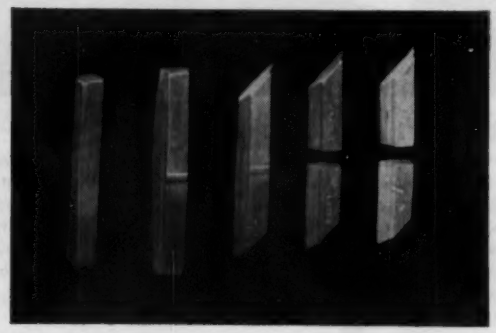
Compressor through-bolts . . .

1⅛ in. x 5 ft approx, of chrome-moly steel, hold wheels and stub shaft together to form rotor. To assure alignment and proper compression in rotor, nuts are tightened to 0.060-in. extension. To assure extension throughout length, rather than in threads alone, bolts are necked behind threads, then fluted for their entire length. Two flutes on each of two bolts are fluted at a time on this Cincinnati miller. Bolts, on centers, are held against shoulders of a magnetic fixture

After blades are set . . .

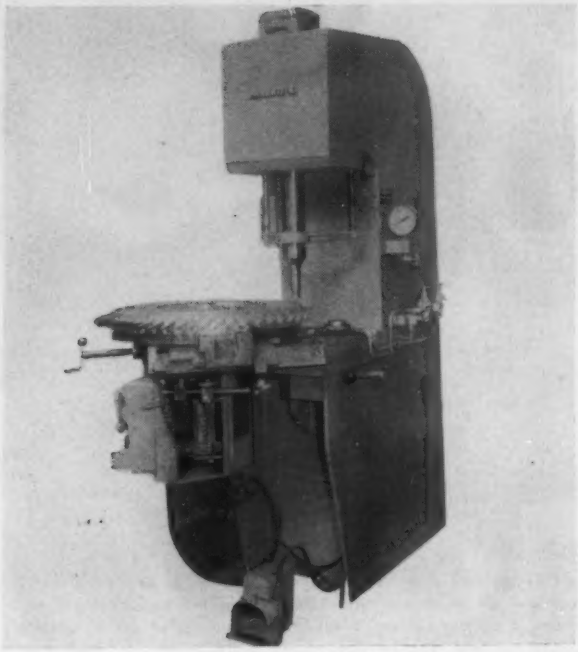
in wheel dovetails, spacers are required to fill dovetail ends. These are produced by cold-coining cold-rolled steel to proper dovetail shape and contour, then ends are cut at a slant and the piece cut in two to provide the two spacers for a slot (below). Formerly, these were made by broaching, grinding to fit wheel contours, and cutting to length (left). New method saves 75% in stock, 80% in cost



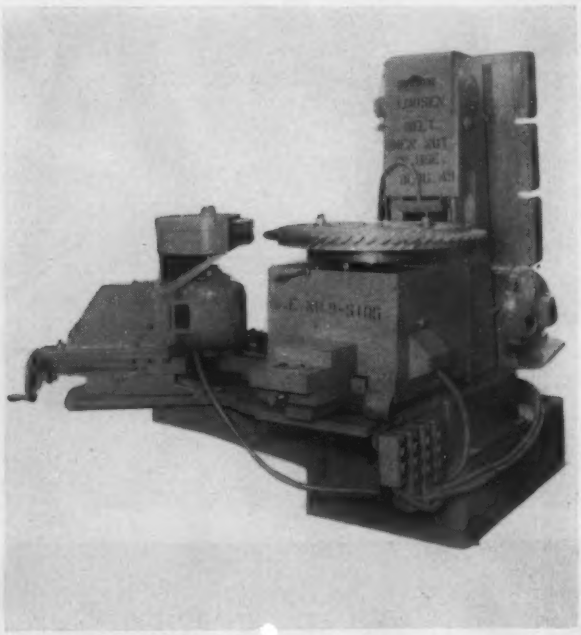


Wheel assembly requires staking and

After blades and spacers . . .
are assembled in the wheel, the assembly is staked on each side in a Hannifin hydraulic press. The punch is a bar-shaped projection backed by a flat, so it cannot be driven in too far, regardless of metal condition or press force. Fixture includes a series of index plates, so indexing can be set for a given wheel. Plates are in the housing under the fixture support



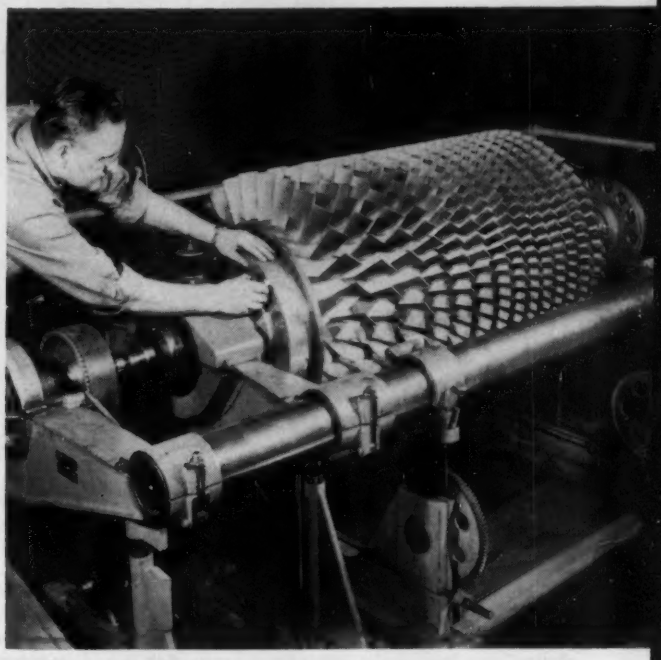
A Gisholt balancer . . .
with drill head added by GE, balances the assembled wheel. The wheel is set on an axis suspended on metal ribbons so it can be balanced in two directions by adjusting dials in foreground. Readings on dials are referred to a chart to determine depth of hole to be drilled. After drilling, wheel is rotated 90° and process is repeated. The wheel could be balanced by drilling one hole in the exact spot, but this is more difficult and time-consuming than drilling two at 90° spacing



Outside diameter . . .
of the assembly is obtained by grinding blade tips in a special Porter-Cable belt grinder. Fixture oscillates sidewise to distribute wear on belt and also automatically feeds wheel in and rotates it as grinding proceeds. When desired diameter is attained, a Micro Switch stops feed. Wheel is retracted, and tampico brush at left fed in by hand to remove sharp edges

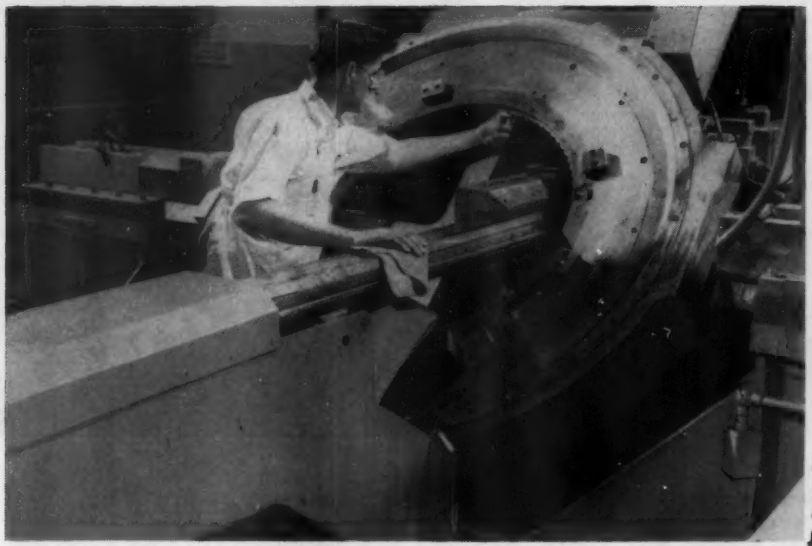
balancing

Wheels are stacked . . .
to form rotor in a Rudel hydraulic press. At bottom is stub shaft, bolted in place on press base. Wheels are added one at a time, indexed into alignment by a pin from below, then pressed into position. Stub shaft is set on other end in the same way, then tie bolts are put through and tightened in sequence

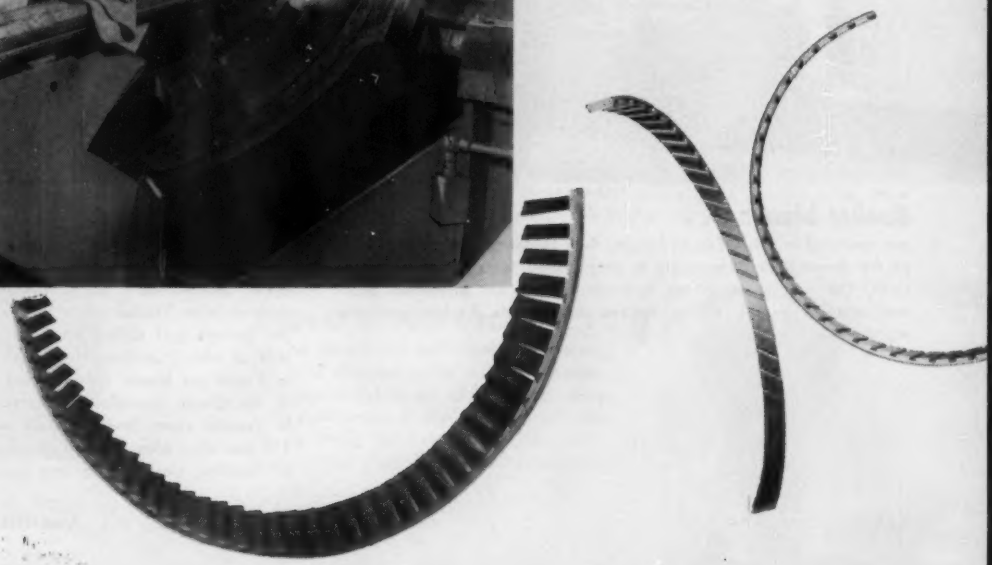


Rotor is balanced . . .
as mentioned on p143, by inserting plugs of proper weight in counterbores over tie-bolt nuts. Actual balancing is done in this Thearle balancer

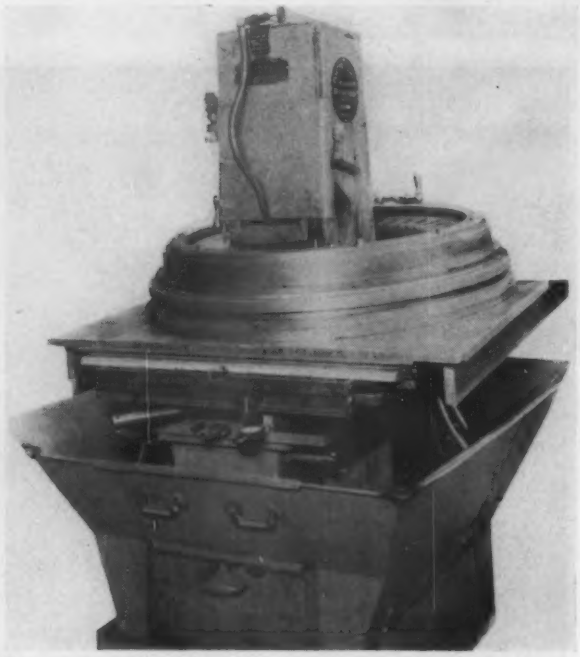
Compressor stator rings are made in halves



Stator rings . . .
are CRS, formed into half rings from bar stock, then machined conventionally. Vane slots are broached on a LaPointe 90-in.-stroke, 20-ton, horizontal machine with a special fixture which can be tilted on trunnions, moved out or in to accomodate diameter, and indexed automatically for a complete rotation. Cutting fluid is Stuart Thred Kut #99

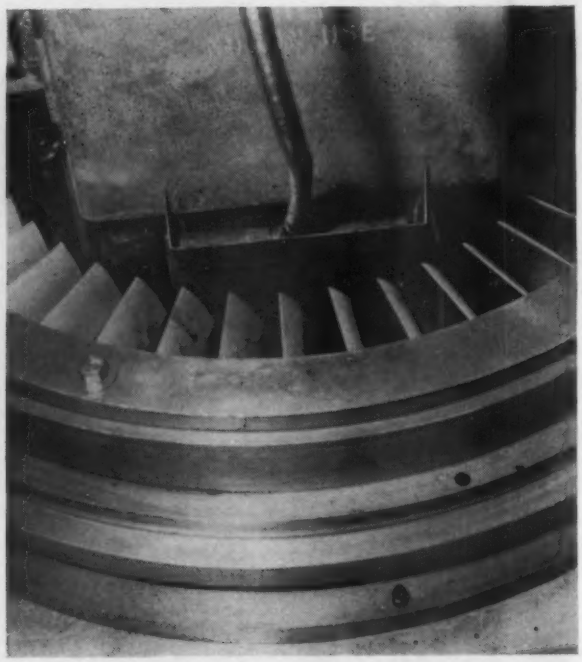


Turbine rotors present special problems



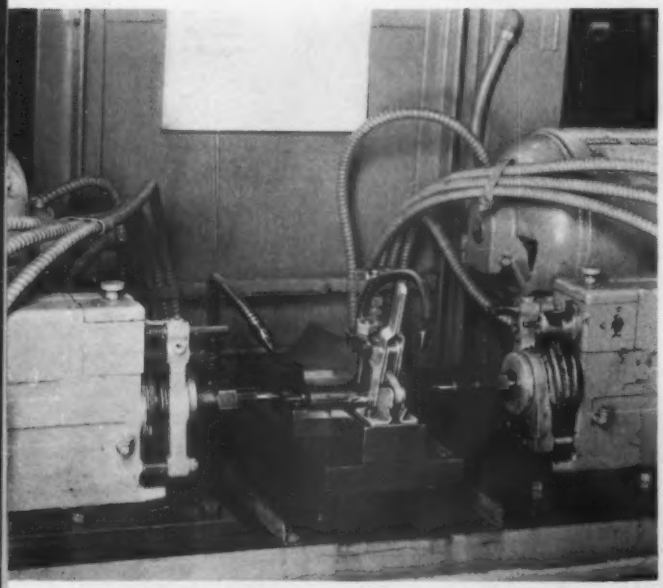
Vanes are set in . . .

then blade ends are ground to proper internal diameter in a Porter-Cable belt grinder with special fixture. Belt is held to proper



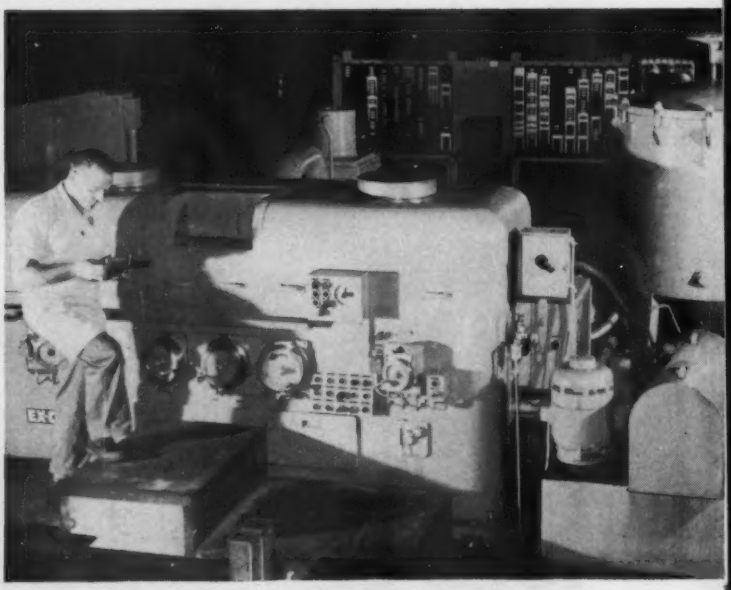
contour by a backing shoe. 36-grit belts are used, with Cimcool as cutting fluid. Closeup shows only edges of convex-curved shoe

Buckets require more individual



Bucket blanks . . .

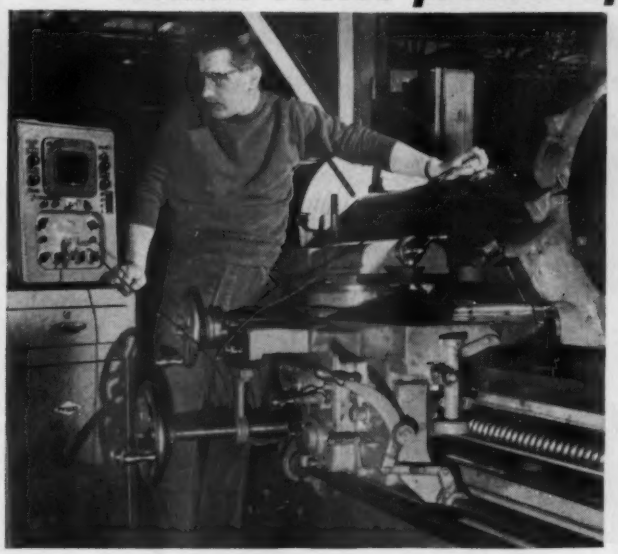
are centered in this GE-built fixture, then center-drilled at both ends of the dovetail simultaneously in preparation for succeeding operations. The two motor-driven hydraulic heads are advanced automatically to preset depth. Bucket material is high-temperature stainless

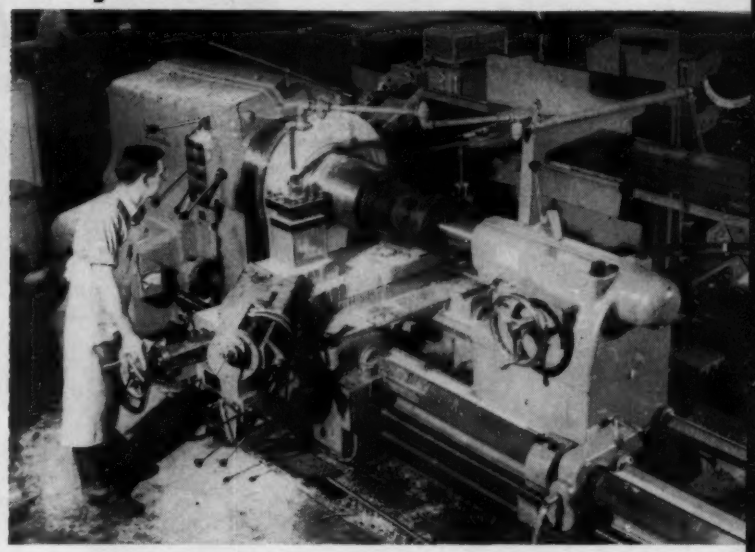


Bucket roots . . .

are ground to pinetree dovetail (right) in this Ex-Cell-O grinder, which has twin wheels crush-shaped as required. The machine cycles automatically, holds tolerances of 0.0003 in. TIR, with high surface finish. Blades are held in a fixture (above right) located from the centers just drilled on ends of dovetail and stop on convex side of airfoil section, locked in position hydraulically. Cycle time is 5 min per blade. Cutting fluid is Thompson #1150. It is filtered in an Olson Superflow pressure-type fuller's-earth unit at right in general view. Savings in oil as a result of adding the unit are $16 per day, plus elimination of previous difficulties with plugging of machine, slow cutting, and burning of work from wheel loading

Turbine rotors present special problems





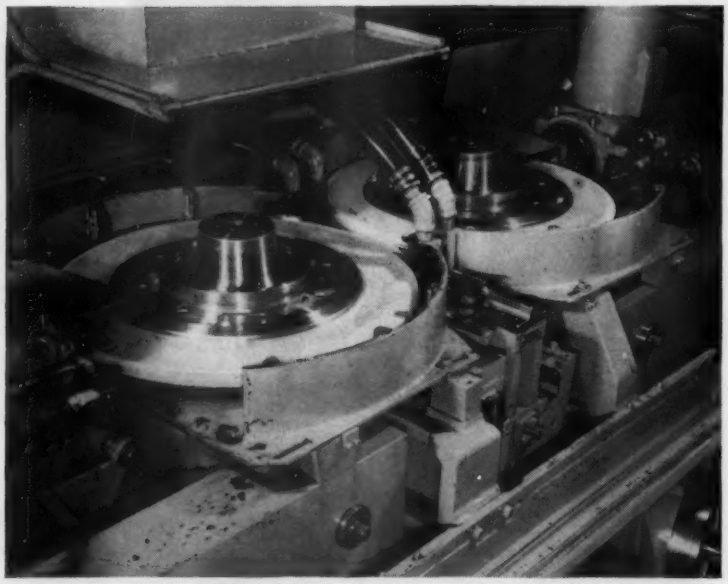
Turned rotors . . .

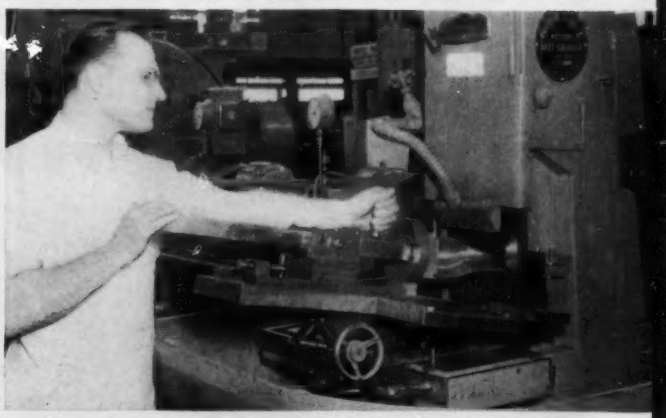
are tested with a portable Sperry ultrasonic unit for internal flaws before they are removed from the lathe. Subsequent checks are made with x-ray, and Zyglo or red-dye penetrant methods to make certain no flaw exists. Any defect in weld or other metal is cut out and rewelded. Other steps in the process are generally like those on the compressor wheel

Turbine rotors . . .

are built up of two parts, a forged SAE4140 shaft and disk, to which a rim of Timken (austenitic temperature-resisting) alloy is welded. Parts are preheated to 400 F, then welded a bead at a time, with cleaning and peening between passes and turning over about midway in the job. Extremely careful inspection is required. The finished job is turned to size and contour in this American Pacemaker lathe equipped with contour follower. A long extension permits contouring of face and shaft as much as 5 ft long

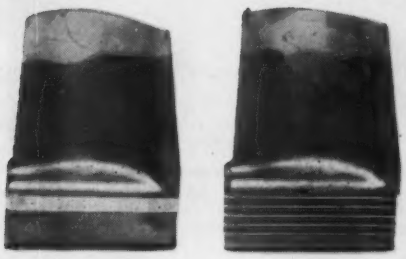
care than blades





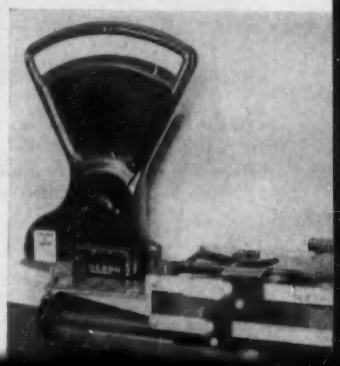
Buckets are shaped . . .

on the Hydrotels as blades are, then ends are shaped to desired tip radius in this fixture on a Porter-Cable belt grinder with 36-grit belt. The bucket root enters a pinetree socket on an arm which can be set to desired radius. The pivot can also be raised or lowered by a screwjack wheel underneath to adjust for bucket tip angle to mate with stator rings. At right is attached a gaging block with hardened-steel disks, those at left of the block forming a go gage, at right a no-go to which the bucket can be swung for checking

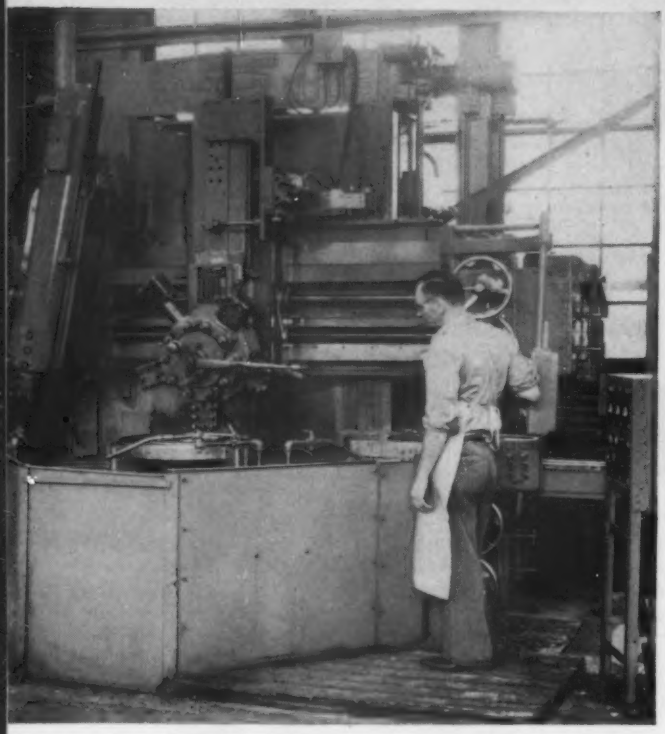


Moment of each bucket . . .

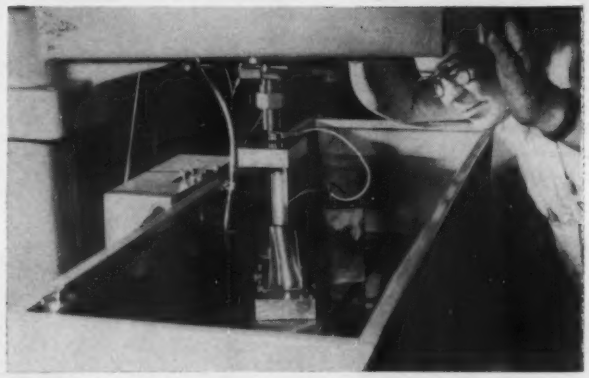
can be determined individually by mounting in a pinetree socket on an extension arm on weight levers of a Toledo scale with pan removed. Weights at front are set to bring total weight within scale range, then scale gives final calibration



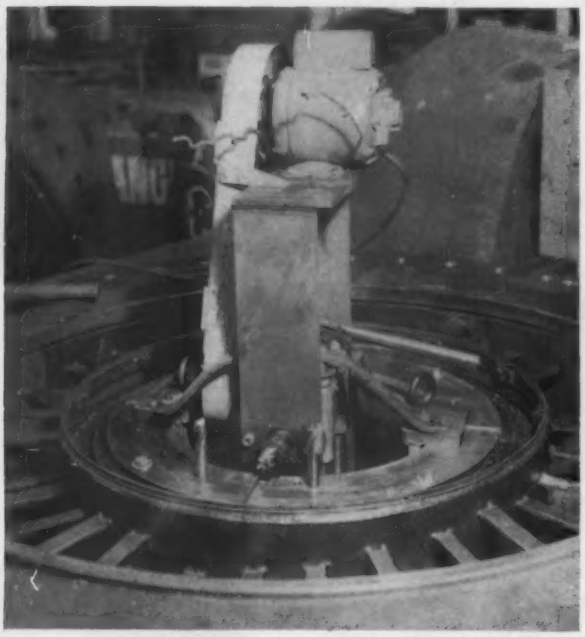
Some other parts require unusual setups

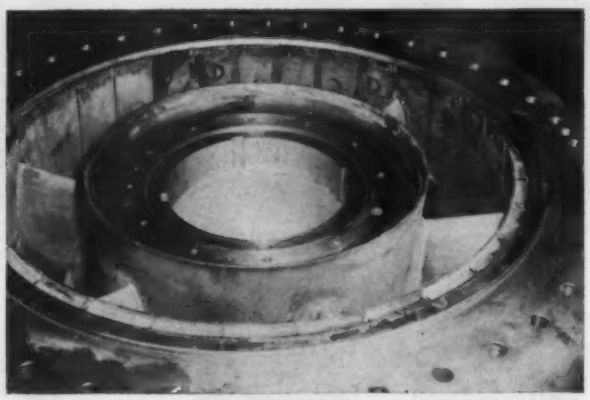


A 54-in. Bullard Cutmaster . . .
with GE contouring control produces a number of special parts. The templet and follower here are at the top of the crossrail to right of head

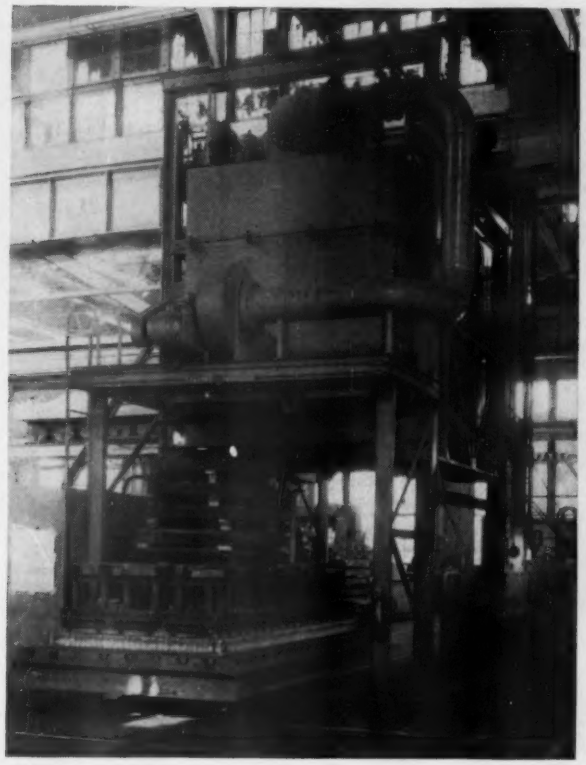


Special shapes . . .
on prototypes or small-quantity parts are cut in an Elox electrical-discharge unit. Slots are cut by hollow-brass tools with 0.020-in. wall (far right), special forming dies by solid brass blocks (foreground). A slot in Type 347 stainless ⅜ in. thick can be cut in 40 min to 0.0002-in. tolerance, while a 3 x 4-in. die-half can be made in hardened tool steel in 5 hr. Cooling holes were drilled in a nozzle partition of a special material too hard to drill (center in group) with tubular tool shown below it. Closeup shows an experimental hollow bucket being made



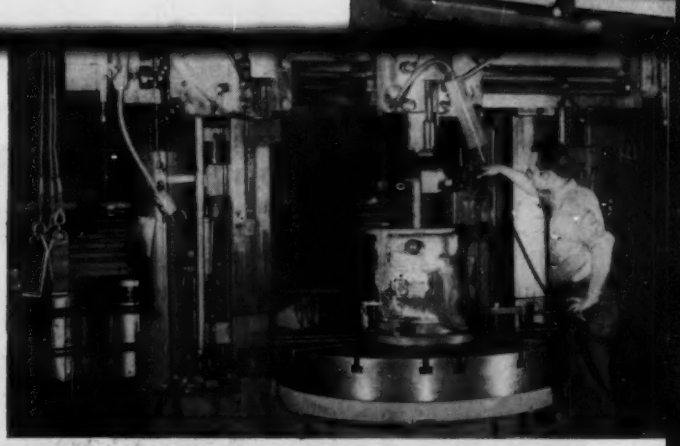


Three axial slots . . .
90° apart in the bore of the exhaust casing (for locating bearing housing) are cut with this portable unit, a Versa-Mil with belt drive from a motor and an adapter to position it. The job is now completed in 8 hr—less time than formerly required on a vertical mill, and machine investment is obviously far less



Diaphragms . . .

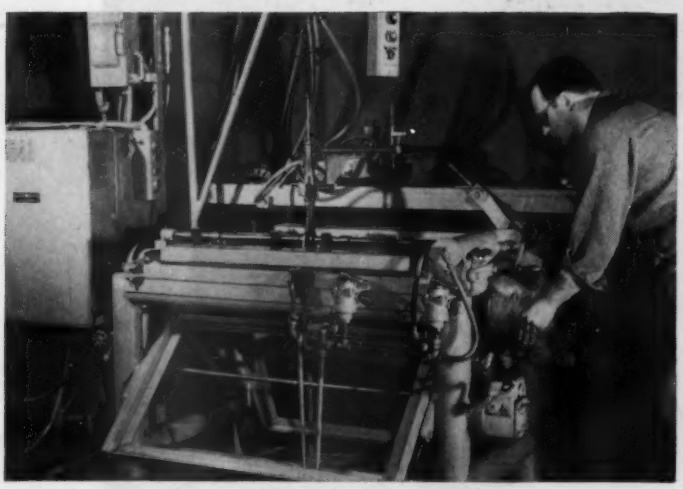
turbine rotors, and miscellaneous parts are stress-relieved in an overhead car-type, gas-fired, atmosphere-controlled furnace. Two cars permit one to be loaded while the other is in the furnace. Overhead position reduces floor-space requirements, gives greater flexibility, and saves gas



Bearing housings . . .

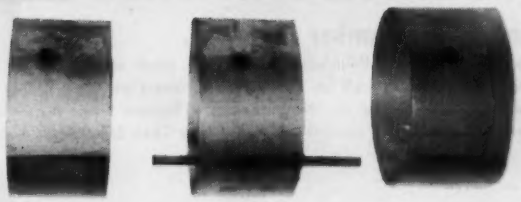
in two parts, must have a spherical seat at one end, anywhere from 6 to 12 in. in diameter (or larger, if need arises). To replace former boring and scraping, the job is now done with a "balling" grinder, an air motor driving a grinder shaft by V-belts. The air motor is held by a socket clamped in the toolpost of a boring mill. This socket also includes a bore in which is adjustable the shank of the head that carries the grinding wheel. Cup wheels of desired diameter are trued with a diameter dresser, then fed in just as a boring tool would be while the boring-mill table is rotated. This generates a seat accurate within 0.0005 in.

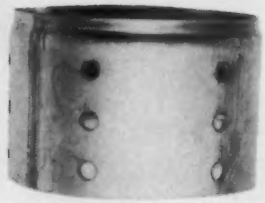
A half-dozen ideas in forming sheet-metal parts



Because stainless steel is the material . . .

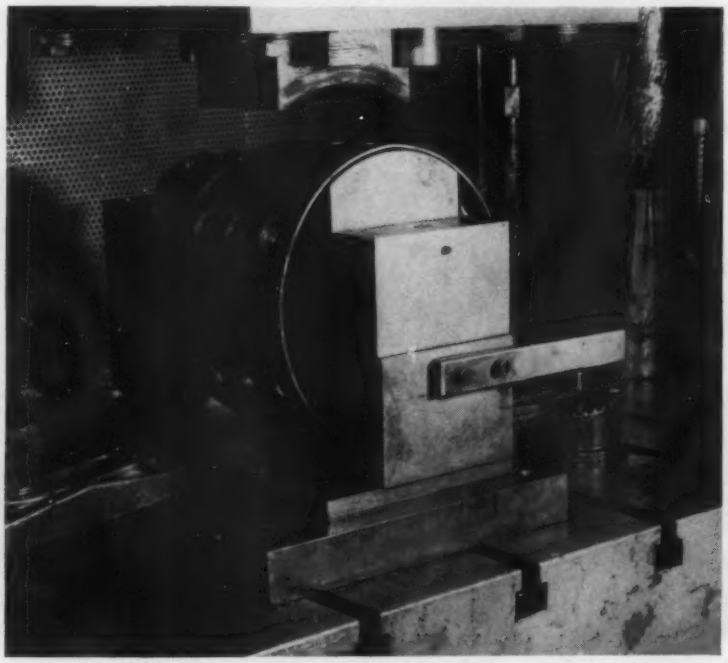
submerged arc welding is the common assembly method on sheet-metal parts. Most elements of "cans" (combustion chambers) are welded from strip, then formed. In some cases, welds are machined off afterward, and no evidence is left of their existence. Here is a special inert-arc setup for welding combustion-chamber parts





Once a Warner & Swasey lathe . . .

this is now a special spinning machine with some unique elements. Combustion-chamber parts are placed on an expanding mandrel that replaces the headstock, and actually formed to a required taper by drawing in the collet. Then either of two spinning disks of hardened tool steel, one on front of carriage, one on rear, is brought in to form a neck. Two different shapes, or first- and second-operation wheels, may be used. The toolpost, turned 90°, carries a tool to square the end and cut a chamfer

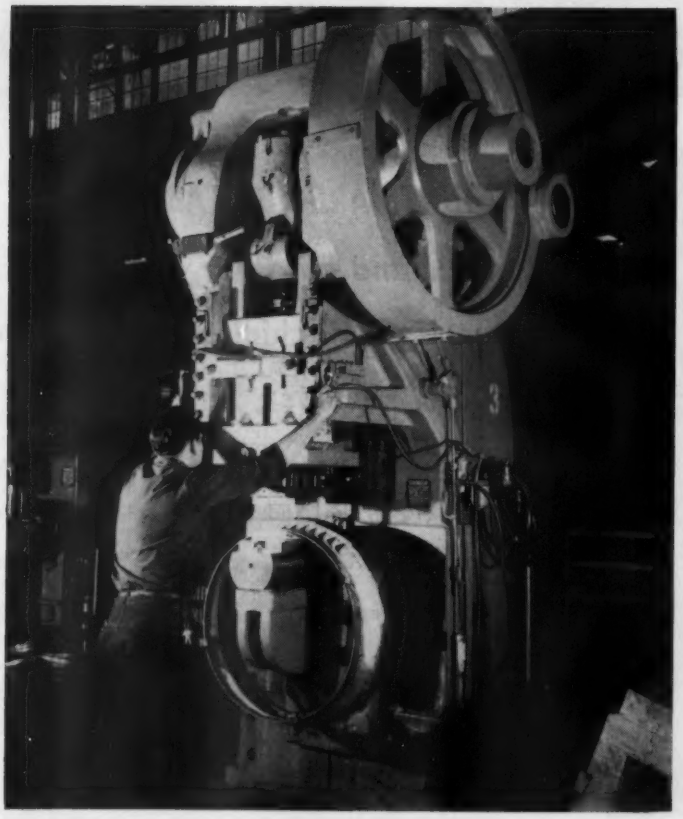


Combustion-chamber parts . . .

have 1-in.-dia holes (finished) in a pattern, each with a projecting thimble with wall cut off at 20° inside to direct air flow. Thimbles were formerly welded on. Now they are formed from the metal around the hole by a special offset die in a Lake Erie press. A disappearing pilot centers the hole over the female die, then a pressure clamp and swaging punch come down in turn and form an off-center collar with a wall higher on one side (20° with axis). The closeup shows the form of the thimble, with wall higher at rear

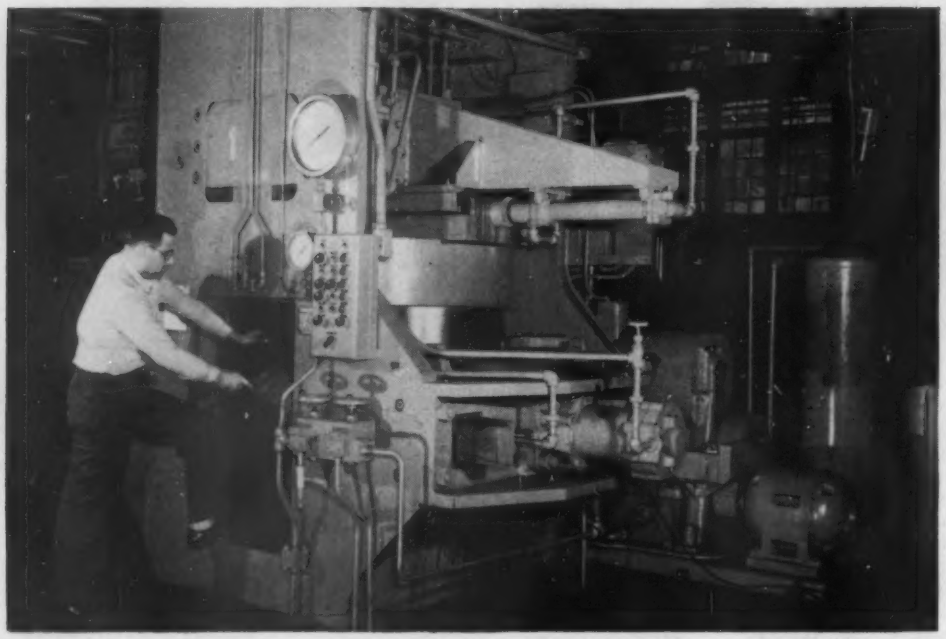
This large-diameter . . .

turbine-nozzle side-wall (4 ft) was formerly a heavy tapered 900-lb forging as at left, machined to shape. It is now made quite simply by welding up a strip into a ring weighing 70 lb, then forcing the ring over a male die of desired contour in a press. Contrary to expectations, the metal flows over the die to exact contour, does not flare or buckle. As two walls are used per turbine nozzle, material savings alone are 1660 lb of expensive stainless (Type 347). Machining time and elimination of this amount of chips are about equal savings. Further, contour tracing in a boring mill is unnecessary

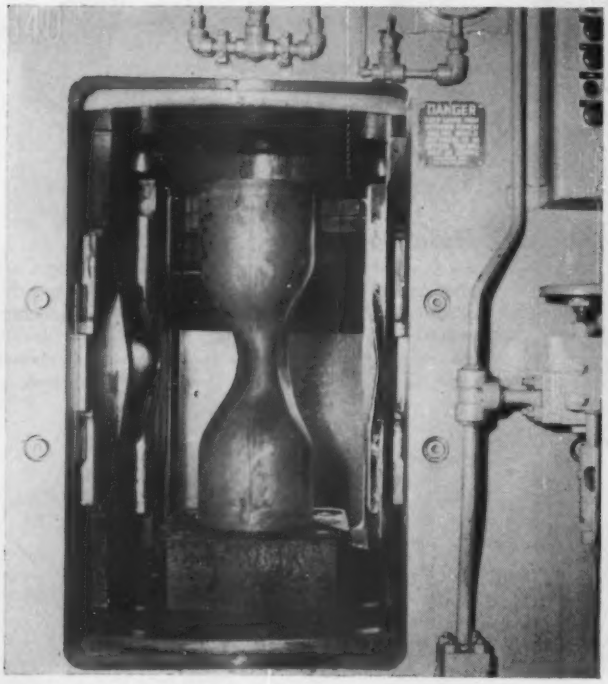


Stator-vane slots . . .

are punched in rings in this Bliss 100-ton horn press, pictured on an earlier cover (AM—Aug 3 '53). Shapes are difficult to punch because of thin tail sections and compound-curved contour, but sharp, close-tolerance dies do the trick. A ring is set inside the workpiece to index on a pin in the lower die, thus locating slots accurately



Hydraulic shaping . . .
of transition pieces is done in this Watson-Stillman bulging press. A 9-in.-dia tube long enough for two pieces is set up on the lower seal, the head brought down to seal the upper end. Side rams close in to mash the tube. Then 10,000-psi hydraulic pressure inside the tube bulges it to final shape against the side dies. When cut in the middle, it makes two transition pieces



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GROUP OF APPRENTICES in a class of the Cleveland Trade School on theoretical aspects of die sinking. Apprentice Joseph Ruks at the blackboard is explaining a highly technical problem. Apprentices receive the same hourly wage in the classroom as they do when in training in the plants

Die-sinker apprenticeship takes eight years in Cleveland

Area program, administered by management and labor together, and a model for others, has been operating successfully since 1942. . . . Here are details

REGINALD PERRY

Fifty-one young Clevelanders are today going through a tough eight-year apprenticeship in the most exacting and intricate of all Metalworking crafts—that of the die-sinker. The 51 are hand-picked for unusual aptitude by Cleveland management and labor, joint sponsors of a city-wide apprenticeship program.

These 51 youngsters consider themselves potential members of the elite of Metalworking. And well they might — unquestionably it takes a high degree of skill to transform alloy-steel blocks into perfectly mated dies of an almost endless variety of designs to be used in today's high-speed forging presses and hammers.

Each die they will ultimately produce must be accurate within a few ten-thousandths of an inch; it must not deviate in depth, width, circumference, or angle of indentation—or it will fail under impact.

The die sinker must, of course, work in reverse from blueprint or model — making the impression rather than the piece itself. Further, he works in three dimensions, as an engraver or intaglio carver does. It is, therefore, logical that he should learn first to work in two dimensions—on a trimming die, for example, which removes the parting flash from a forging. This actually provides a breakpoint for the apprenticeship: four years on trimmer dies, four on forging dies. This is not as costly to the employer as might be imagined, because apprentices work much of the time on dies for actual use, being given

LAWRENCE PERREN is finishing an impression die with hand tool, has completed nearly eight years of apprentice training. He has three brothers in industry; one is a diesel mechanic, one is working in a forge shop, and another is a contractor in the excavating business.

more and harder dies to do as their ability and capacity increase.

APPRENTICE AUGUST KIRCHNER, here milling an impression die on a Hydrotel, has been in training for nearly 8 years in the shops of the Steel Improvement & Forge Company (where all shop pictures were taken) and will soon be a full-fledged craftsman

A MODEL PROGRAM

The city-wide apprenticeship program in Cleveland was first established in 1942 and has been used as a model practically ever since. In January, 1955, these employers were participating: Aluminum Company of America, Steel Improvement & Forge Company (Champion Div), Buckeye Forging Company, Bessemer Forging ing Company, Cleveland Hardware & Forging Company, I J Frindt Company, Mondie Forge Company, Inc; Midwest Forge Company; Ohio Forge & Machine Corp; Park Drop Forge Company; The Steel Improvement & Forge Co.; Vlchek Tool Company; J W Hardwood Company; and Drop Dies & Forging Company.

As the drop-forging industry is largely concentrated in Ohio, the greatest number of die-sinker apprentice-training programs are in cities in that state—a total of eight.

AREA APPRENTICESHIP COMMITTEE

The Cleveland program was originally established with the assistance of field representatives of the US Department of Labor's Bureau of Apprenticeship. It is now registered with the Ohio State Apprenticeship Council. The program is administered by an area joint management-labor committee, in cooperation with shop joint committees. The area committee is composed of six members, three representing Local ♯10 of the International Die Sinkers Conference. There are two members on each shop committee, one representing management and the other labor.

Employer members of the area committee are Richard G Wardrop (chairman), director of training, Aluminum Company of America; John P McCoy, foreman, Die Room, Steel Improvement & Forge Company. Labor members are Martin Rose, president, Local ♯10, employed by Steel Improvement & Forge Company; Carl Webbeking, vice-president, Local ♯10, employed by I J Frindt Company; and Richard Arnold, secretary-treasurer, International Die Sinkers Conference and Local ♯10, employed by Steel Improvement & Forge Company. H B Armstrong, instructor, Cleveland Trade School, is Committee secretary and consultant without vote. Also serving as consultant to the committee is Oscar R Poole, area supervisor, Bureau of Apprenticeship, US Department of Labor.

ADMINISTRATION OF PROGRAM

The area committee is generally responsible for administering the program and policies relating to its operation. It approves apprentice-

A PROSPECTIVE APPRENTICE is pictured here being interviewed with regard to his qualifications by the members of the Area Joint Committee. Every applicant must pass both verbal and written examinations before he is accepted for training. Members of the Committee, on the left of the apprentice, are Richard Wardrop, chairman; Carl Webbeking, and Fred Raspe; and on his right Martin Rose, Richard Arnold, Stanley Locke and H B Armstrong, Committee secretary

ship agreements and registers them with the Ohio State Apprenticeship Council; reviews progress reports of apprentices; plans and sponsors annual apprenticeship completion ceremonies and recommends the awarding of completion certificates.

Cooperating with and reporting to the area committee are shop committees — one in each shop. Each committee functions in a supervisory capacity with respect to the training of every apprentice employed in the shop, and transmits current records of progress to the area committee, with an evaluation of each apprentice's performance.

In the shops, each apprentice works under direct supervision of a foreman or journeyman to whom he is assigned by the shop committee. His shop experience is supplemented with classroom instruction.

To qualify for apprenticeship in impression-die sinking under the Cleveland program, an apprentice must have completed the four years' apprenticeship in trimmer-die sinking, and in most instances have had some prior experience in the shops. Apprentices are usually a good deal older than they are in most of the other trades. Applicants are accepted for training in the trimmer-die sinker trade up to the time they are 27 years old, and in the impression-die sinker trade up to the time they are 35 years old. The higher age of beginners in the trimmer-die trade is permitted to give prospective apprentices time for some advance work experience before starting the all-round training for a craftsman's career. The higher age of a beginner in the production of impression dies is permitted to give him ample time to complete the first four years of training in the other craft, and also to allow time for any delay that may occur before there is an opening for him to start as an apprentice on the second four years of training.

APPRENTICE WORK SCHEDULE

The first operation that apprentices learn to master in both crafts is the preparation of templets, castings, forgings and gages used in the production of dies and punches, locks, dowels, edgers, fullers, drawing horns, gates and cut-offs. Templets and other devices are designed from layouts to assure accurately, within a thousandth of an inch, the contours and angles of every type of die, and the variously shaped indentations in impression dies. In learning this preparatory operation, apprentices become proficient in the utilization of molten lead in the formation of lead casts used for layout and inspection purposes, as well as the formation of sheets and other pieces. Trimmer-die-sinker apprentices are required to spend two months on this work, and impression-die-sinker apprentices must spend six months in mastering it.

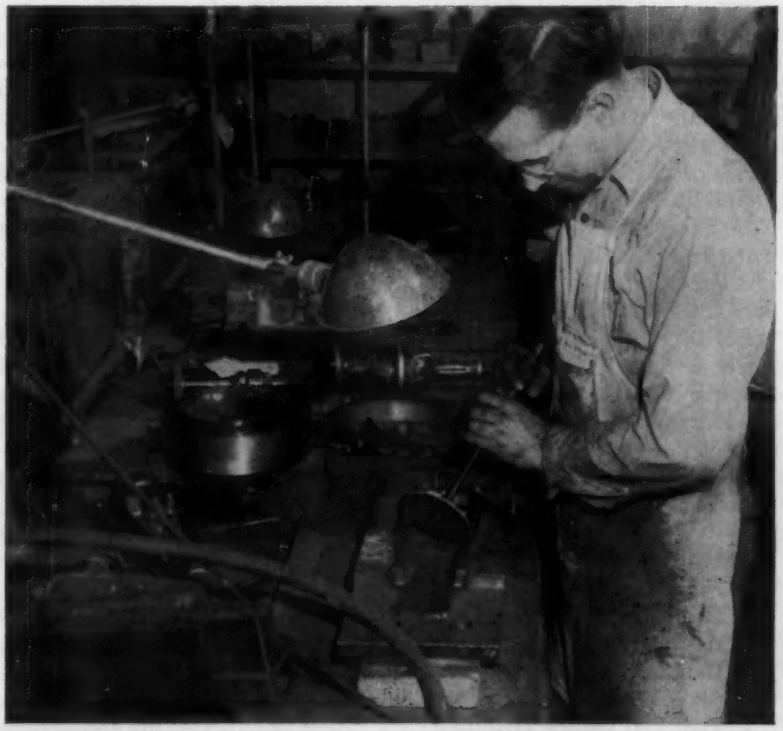
Although layout work comes first in the production of dies, it comes second in the training schedule and continues for six months in each of the two crafts. During this period, apprentices are thoroughly trained in the art of scribing layouts on the face of metal blocks and sheets, in accordance with blueprints and specification. The scribed layouts are then followed in making the templets and other pieces listed above.

The third operation is machining the dies, punches and adjacent metal parts. This training period is the longest in the entire work schedule, 28 months in trimmer-die making and 24 months in impression-die making. Apprentices learn to machine the dies, die parts and inserts, developing the work from drawings and models. They are given extensive experience in shaping the contours and impressions; cutting cavities in punches and clearances; shearing, drilling and tapping the holes specified; boring, turning, grinding and machine polishing.

The final job is bench work—chipping, scraping, filing and polishing. This takes 12 months in each trade. Apprentices also learn to test the fit of templets, types, gages, forgings and casts used in making the dies and punches. In addition to that, they learn to engrave and stamp identification names and numbers in the cavities of dies for reproduction.

CLASSROOM INSTRUCTION

Classroom instruction is provided by the Cleveland Trade School. Trimmer-die-sinking apprentices



APPRENTICE RICHARD PAULL is grinding a trimmer die. The mating punch is at left. Mr Paull has almost completed his last six months of training in the trimmer-die-sinker trade

SUMMARY PERIODIC RATINGS

Name OSCAR J. SMITH — Employer BUCKEYE FORGING COMPANY
Trade TRIMMER DIE SINKER — City CLEVELAND — State OHIO

	TRIMMER DIE SINKER—4 YEARS								IMPRESSION DIE SINKER—4 YEARS								
PERIODS (6 MONTHS)	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	REMARKS
ABILITY APTITUDE	G	G	G														
COOPERATION WILLINGNESS	G	G	E														
INITIATIVE INTEREST	G	G	G														
RESPONSIBILITY DEPENDABILITY	G	G	E														
QUALITY ACCURACY	F	F	G														
QUANTITY AMOUNT	F	F	G														
GENERAL RATING	G	G	G														
RELATED INST. RATING	G	G	G														
REV'D.—APP'D. BY AREA COM.	NOV. 1953	MAY 1954	NOV. 1954														

Beg. Date 5-25-53
Credit NONE
PCD 5-25-57

Beg. Date
Credit
PCD

EACH HALF YEAR, instructors and shop committee rate a detailed report from each apprentice on his shop assignments and classroom work. Grades and other pertinent data are tabulated on this periodic rating sheet.

are required to attend classes a minimum of 144 hr a year—or approximately four hours a week during the term of apprenticeship. Impression-die-sinker apprentices attend classes a minimum of 144 hr a year during the first two years of their training. All apprentices are paid the same wage rate for the hours they spend in the classroom as they receive in the shops, and the time expended in the classroom is counted as part of the term of apprenticeship.

Classroom instruction is conducted by H B Armstrong, the area committee secretary, and Stanley Locke, die-room foreman with the Park Drop Forging Company, both of whom have acquired through extensive experience a thorough knowledge of production methods and technical problems in the industry.

The classroom curriculum includes:

1. Trade Mathematics
2. Print Reading
3. Drafting—Layout
4. Heat Treating—Metallurgy
5. Handbook Reading
6. Shop Theory and Practices
7. Tool and Cutter Grinding
8. Feeds—Speeds—Coolants—Lubricants
9. Die Design and Theory
10. Safety Practices and Precautions

Plant visitations by all apprentices is a scheduled part of related instruction. This gives apprentices a general understanding of the work performed in the shops, particularly the variations of operations performed in making dies. To clarify shop work, the instructors use visual aids extensively—motion pictures and slides—as well as practical demonstrations of machinery and other equipment in operation.

APPRENTICE WAGES

Wages of apprentices increase periodically every six months and are based on a percentage of the current journeyman rate. The trimmer-die-sinker apprentice receives during the first six-month period 68.8% of the minimum journeyman rate in the trade, and this percentage increases every six months, thus:

1st 6 mo—68.8% 5th 6 mo—84.4%
2nd 6 mo—72.7% 6th 6 mo—88.3%
3rd 6 mo—76.6% 7th 6 mo—92.2%
4th 6 mo—80.5% 8th 6 mo—96.1%

After completing his apprenticeship as a trimmer-die-sinker, an apprentice becomes a journeyman with the minimum journeyman wage, and retains that wage during the first six months of apprentice training in the impression-die-sinker trade. Thereafter his wage rate is based on the midpoint of the journeyman rate in the latter trade, as shown in the following schedule:

1st 6 mo—Minimum Trimmer Die Sinker Rate
2nd 6 mo—79.2% 6th 6 mo—91.1%
3rd 6 mo—82.2% 7th 6 mo—94.1%
4th 6 mo—84.2% 8th 6 mo—97.0%
5th 6 mo—88.1%

Wage increases are paid on April 15 and October 15 of each year, providing the apprentice has worked 750 hr or more during the previous six-month period and has made a satisfactory record.

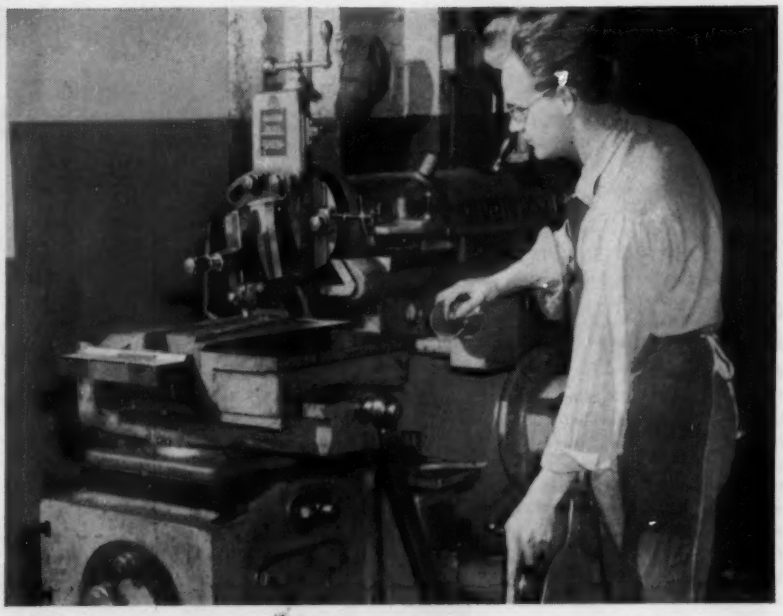
Trimmer-die-sinker apprentices who have had previous work experience are granted credit for that experience and are paid upon entrance, the full rate for the period to which such credit advances them. No more than one year's credit is granted to any trimmer-die-sinker apprentice, and no credit is granted to any impression-die-sinker apprentice.

WHAT APPRENTICES THINK OF PROGRAM

Just as every worker employed in the die-sinking trade, the apprentices in training take pride in being a part of this highly skilled craft. Many of them belong to a family of craftsmen in the trade. To reach journeyman status takes as long as it usually takes to become a mechanical engineer—longer, in fact, than to get a BS degree in engineering, and apprentices are aware of this. They consider those who have attained the status of all-round skilled journeymen in the trade to be the PhD's of the metalworking industry. Judging by statements of several, most apprentices consider the Certificate of Completion of Apprenticeship, which they will receive upon completion, of greater value than a college degree. Said one apprentice: "A college education might have helped me to prepare for apprenticeship in die-sinking work, but there is little to be learned in textbooks on how to do it, as compared with the practical

experience and classroom studies I'm getting here." A similar attitude was expressed by other apprentices interviewed.

So enthusiastic are apprentices about their training that there has been almost no problem of quittals in the Cleveland program. The record of continuous employment of those in training reflects not only the enthusiasm with which apprentices are inspired, but the care taken in their selection and the thoroughness of the tests to which they are subjected during each period of their training.



APPRENTICE JOSEPH RUCKS, JR, is shaping a trimmer die. He was granted three-months credit for previous experience when he started his apprentice training three years ago. He is following in the footsteps of his father, who is a journeyman in the same trade and in the same shops

SELECTION PROCEDURE

Before an applicant is approved for training he must first fill out a two-page detailed application which is reviewed by the shop apprenticeship committee and company officials concerned. The shop committee then refers the application and its recommendations to the area committee for consideration. If the application is approved by the area committee, the applicant is given a series of tests by the Cleveland Trade School. If accepted by the area committe, the shop committee is notified and an employer representative signs an apprenticeship agreement and forwards it to the area committee.

The applicant then is asked to appear before the area committee which explains the various steps in the training program. If he is satisfied with all the conditions, he signs his apprenticeship agreement, and the area committee chairman and local union president add their signatures. The agreement is registered with the Ohio Apprenticeship Council.

APPRENTICE TESTS AND PROGRESS REPORTS

During training, a meticulous record is maintained by the shop committee of the work and progress of every apprentice. Each apprentice is also given periodic tests by his classroom instructors. At the end of every six months, he is required to prepare a detailed report explaining the jobs and operations to which he has been assigned in the shop, as well as his studies in the classroom. This report is rated by his instructors, the shop committee, and reviewed by the area committee. Pertinent data contained in these reports, with grades, are tabulated on a master periodic rating sheet.

At the end of his apprenticeship, every apprentice is awarded a Certificate of Completion, issued by the International Die Sinkers Conference, which is signed by a representative of the employer, of the local union and of the Bureau of Apprenticeship.

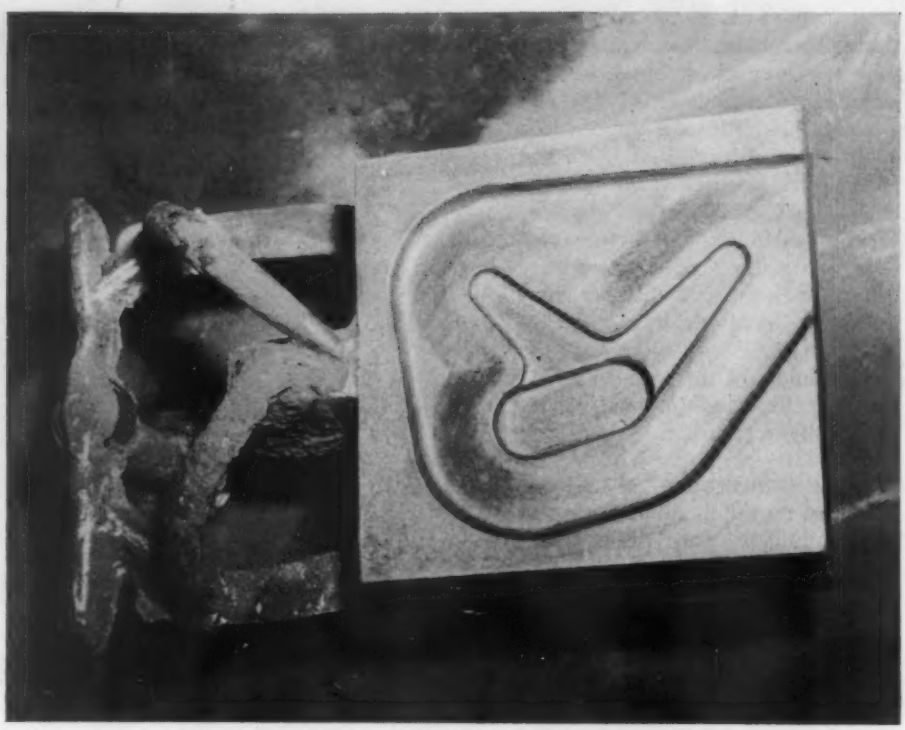
ALL SKILLED WORKERS SUPPLIED BY APPRENTICESHIP

Since the establishment of the program in 1942, all impression and trimmer die sinkers employed in the die rooms of the participating companies have been provided by apprentice training. It is a policy of the area committee, the participating companies and the labor union to employ as journeymen and shop supervisors only men who have had the advantage of the thorough training made possible by this program.

To maintain the skilled labor force, it is necessary to keep in training continuously a certain number of apprentices. By means of the apprenticeship program, new young blood is siphoned annually into the ranks of journeymen. While the quota of apprentices employed currently is usually one to every five journeymen, the ratio may be changed depending upon the number of apprentices needed.

The program has the enthusiastic support and backing of both management and labor. A J Sanford, chairman of the board, Cleveland Hardware & Forging Company and chairman of the local Forge Group, an affiliate of Associated Industries of Cleveland, says: "The thorough training in the shops, plus technical instruction in the classroom, is assuring the highest type of workmanship in the production of dies used in drop-forging industry. The success of the program has been a result largely of the splendid cooperation of labor and management in carrying out its objectives."

The viewpoint of labor is expressed by J G Meiner, president of the International Die Sinkers Conference, who was one of the original sponsors: "The program, as jointly conducted by management and labor, has been highly successful. As a result of their cooperative efforts, the men who have had the benefit of the program are highly competent and versatile, fully capable of coping with advancing methods of die production and techniques."



Cast beryllium-copper die . . .
for forging AA 7075 aluminum bell cranks has excellent surface finish in the "as-cast" condition. Among other advantages, this material acquires a burnished surface finish after three or four parts have been forged, apparently as a result of an oxide film caused by heat and pressure. This self-lubricating quality is especially useful when forging magnesium parts because such parts are easily removed without resorting to knock-out punches

Beryllium copper cuts forging

Prototype aircraft forgings have long been a problem because of the time and expense involved in making steel dies and the difference in physical properties obtained by using machined parts. Now new materials have been developed to make forging dies quickly, accurately, and cheaply

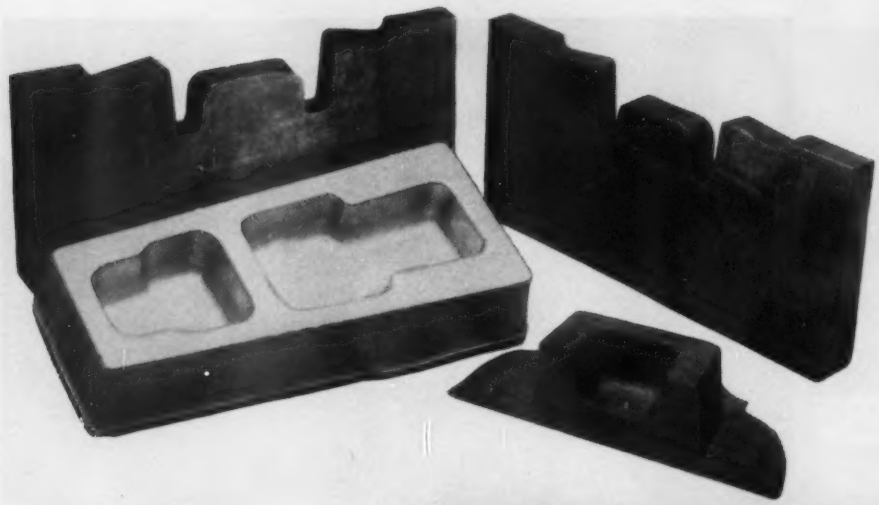
GEORGE H DE GROAT, associate editor

Until recently, only two choices were open to builders of prototype aircraft when faced with the need to make structural parts and evaluate their mechanical properties. One was to make expensive forging dies and actually run a few parts, while the other alternative was to machine a few.

In the first case, considerable lead time was required to make such forgings—sometimes as much as 3 to 6 months, or even a year—and the cost per piece for limited production was excessive. Machined parts reduce this delay, but have the disadvantage of being weaker than forgings, so true evaluation of the operating performance of production parts is difficult.

Cast dies

To meet the problem of making prototype and other short-run parts quickly and with the physical properties needed in production parts, North American Aviation, Inc, Columbus, inaugurated a research program designed to investigate materials for forging dies that would simplify die making and also



Various materials . . . are successfully forged in beryllium copper dies. A magnesium wing rib and a cross-section of a 4340 steel rib are shown here with sections of the die from which they were made. Both AA 7075 aluminum and AZ80 magnesium have been made with better die finishes at the end of a run than at the beginning because of the burnishing effect on the die material. Surfaces of the forgings are usually better, too, than those from steel dies

Cope and drag . . . of forging-die pattern indicate simplicity of making dies of castable, remeltable alloys as compared with conventional die-sinking of steel dies. Besides reducing die costs and lead time required to make forgings, parts obtained are stronger than those obtained from machined billets—provide a more accurate evaluation of mechanical characteristics

die costs

have sufficient life to permit running anywhere from 100 or 200 pieces to several thousand.

Working with Wyman-Gordon, Beryllium Corp, and National Lead, North American developed a method of casting stable forging dies from beryllium copper and other castable remeltable alloys.

As a result, die costs have been cut by as much as 75% and lead time reduced to an average of 3 to 6 weeks. In one instance, a die estimated to cost $2000 by conventional die-sinking methods was made for $550 by casting one of the new alloys.

In addition to cost reduction and time saved by employing conventional casting methods, the new die material has several other advantages. One is its versatility—dies cast from these alloys can be repaired by welding, and they can be melted and re-cast if dimensional errors occur through errors or differences in shrinkage. Although the cast die cavities are polished to obtain desired finishes, steel dies must be hardened as well as ground and polished before thay can be used. In operation, these dies are self-burnishing—thereby minimizing needs for die lubricants and producing an improved die finish in operation.

Part size and die life

Currently, dies of this material are being made to produce 75- and 80-lb forgings and no forseeable limit has been placed on the size of part that can be produced. In fact, a 5-foot, 100-lb aluminum aircraft part will soon be in production for North American on a beryllium-copper die to be run in Wyman-Gordon's 35,000-ton forging press.

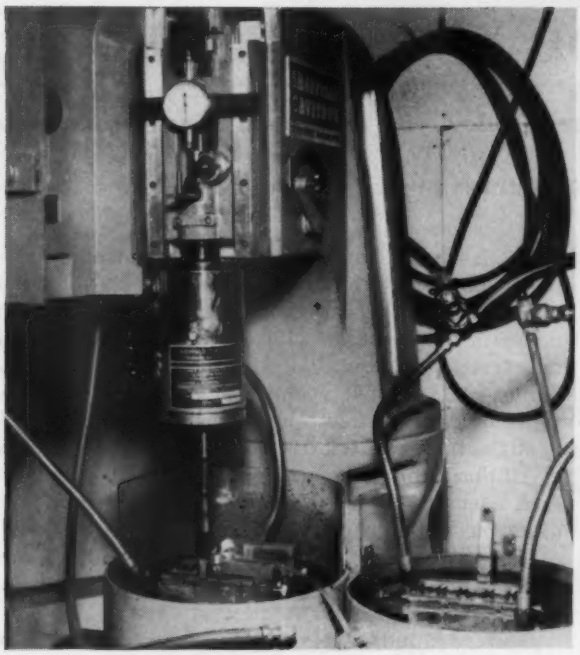
In running steel forgings in one such die, 17,000 pieces were produced and die shape and sizes were still within tolerances. By comparison, a hardened-steel die might have produced 25,000 to 30,000 pieces before wear would affect its operation, but annealing, re-sinking and re-hardening would have been necessary.

Dimensional accuracy in cast dies compares favorably with that of steel dies and such materials as magnesium, alloy and carbon steel, and aluminum are now readily forged for aircraft parts.

Lathe headstock sheave . . .
. . . is contoured in right-angle lathe with two-tracer control and two turrets. Right-hand turret bores sheave, then left-hand turret cleans up recess in back. Work is reversed, and both turrets work together to rough and finish contour, and left-hand turret makes inside cut on recess while right-hand turret makes outside cut. Two cuts meet and match at recess center. *Monarch Machine Tool Co, Sidney, O.*

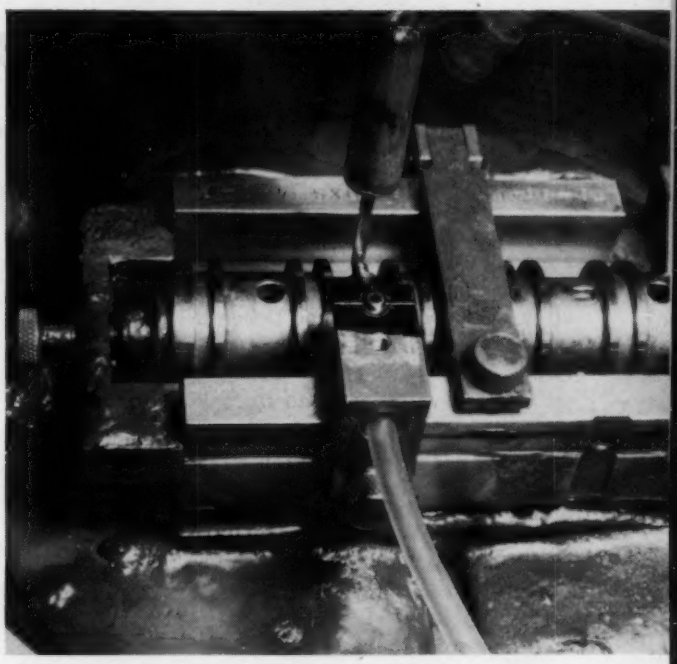
talented tooling

Telescoping leg . . .
. . . for DoAll bandsaw lets operators change table angle easily and accurately when cutting variable contours. Unit works in form-block department where aluminum, steel, masonite, and other materials are sawed. Leg is anchored to machine base and pivoted under table end—and friction lock is partly tightened to take much of the weight off the leg. Maximum angle possible is 47°. *Temco Aircraft Corp, Dallas, Tex.*



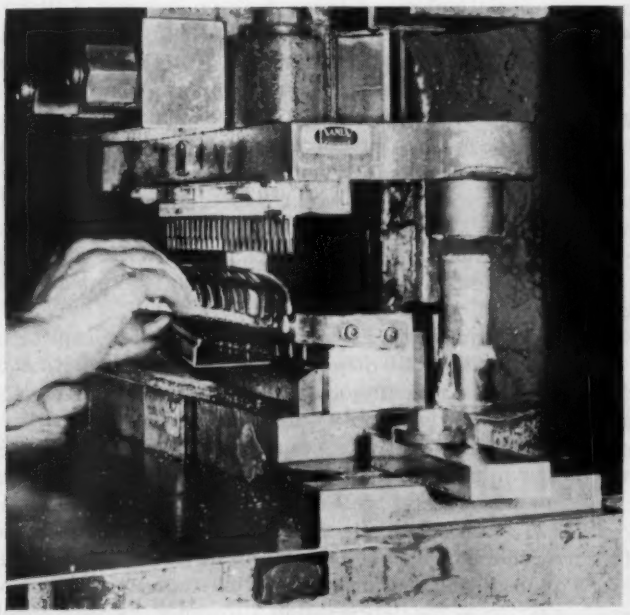
Ultrasonic cutting . . .

. . . produces rectangular slots in hydraulic sleeves for aircraft control systems in fraction of former time. Other advantages are elimination of burrs and breakouts at hole bottoms. Left-hand setup is for roughing with 280-grit abrasive, right-hand fixture is for finishing with 800-grit boron carbide. Both rigs have slurry-recirculating systems



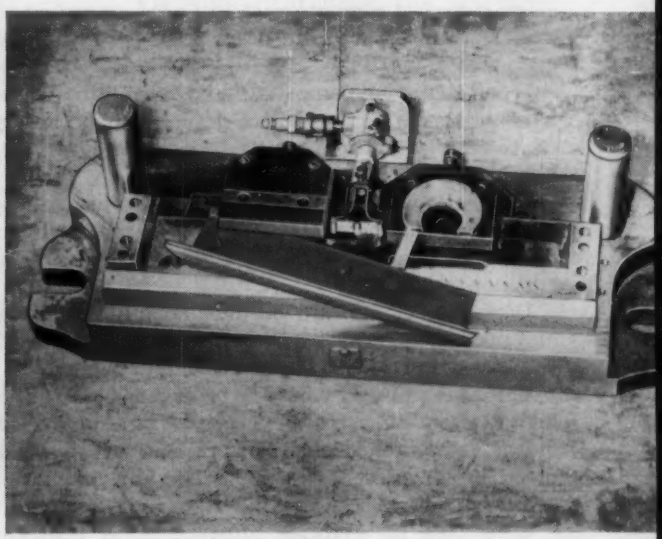
Bit oscillates . . .

. . . at 30,000 cycles per sec, producing forces of 180,000 gravities on grit and vapor bubbles formed next to tool. Slots are 0.125 in. long, and 0.050 or 0.030 in. wide, specified to close tolerances including maximum corner radii of 0.002 in. Plunjet air gage in front is connected to Sheffield Precisionaire gage that helps locate tool above each hole. *Chance Vought Aircraft, Inc, Dallas, Tex.*



Hidden magnets . . .

. . . pull heating-register frames into piercing die against stops with 25-lb force, insuring alignment, eliminating scrap losses that often amounted to 10%. Frames are later assembled with fins, which fit into holes pierced in this operation on 85-ton press. Each frame may have 14 to 24 holes in a row



Die is fitted . . .

. . . with two Carboloy Alnico V horseshoe magnets, covered during operations by non-magnetic plates. Frame shown is not yet pierced. Work is ejected by air-operated knockout that overcomes magnetic pull instantly. *Hart & Cooley Mfg Co, Holland, Mich.*

The pinching shoe

How, with a commonsense approach to replacement today, you can avoid disaster tomorrow

ROBERT C TRUNDLE, president, THE TRUNDLE ENGINEERING CO, CINCINNATI

The president of the company studies the profit forecast for the year. *It looks good.* "If things hold up through November and December . . . we're going to have some real money to spend," he says to himself. "Now we're going to do some of the things we've been wanting to do for a long time."

So, in his mind's eye, he plans how the money is to be spent. And here he's likely to get into trouble.

If he's figuring on an operating profit of, let us say, $200,000, he may think he will have $200,000 to spend.

But he won't.

There are certain prior claims on that $200,000: First is income tax. Second claim is commitments such as profit-sharing. Third is dividends.

And where's the *cash* coming from? Profits are not all cash. If he spends the entire $200,000, he may find cash depleted by $40 to $50 thousand.

So what finally happens? The "things we've been wanting to do for a long time" get put off.

And only too often what gets put off is the replacement of obsolete equipment. The very thing that is most essential is not done, because it had no priority.

And that's where the shoe will begin to pinch.

Many an old machine still operable in the physical sense of the term is today completely obsolete because it cannot compete with the productivity of its modern counterpart in terms of "cost per piece produced."

When that shoe begins to pinch, something has to be done about it. So—where do you get the money for modernization? For the replacement of obsolete equipment by modern equipment?

In theory, such funds are supposed to be built up out of depreciation allowances, to be retained (again in theory) in a depreciation reserve. But how many companies do that?

Depreciation appears on the income account as an expense. But many companies seem to regard it as income on which taxes don't have to be paid.

This is completely contrary to the basic concept of depreciation. It isn't new money coming in—it's *old money coming back.* If it's spent for dividends or other purposes, the result is literally dissipation of invested capital.

Let's take an extreme illustration. A company starts with a brand-new plant. It replaces none of its equipment. It treats its depreciation allowances as if they were income, uses them to help to pay dividends, or shades its prices in a competitive situation.

At the end of 15 years, all of the machines in the plant are high cost and obsolete. The company has no funds left for replacement. Where do the company's stockholders stand then?

The course of safety is that of establishing a replacement policy before the shoe begins to pinch.

Suppose, for example, that in 1955 a company makes a net profit of $150,000. It has currently a depreciation allowance of $10,000 a year. The company should plan to spend that $10,000 in 1956 for replacement of obsolete equipment—and if that isn't enough, they can take $5,000 more out of surplus.

All that capital, even though spent, will be recovered over the life of the equipment, in depreciation allowances.

And as to the $5,000 currently taken out of surplus—that should be offset in short order by increased earnings from savings in cost.

Bear in mind that such a transaction *does not change the stockholders' equity as shown on the balance sheet.* Their money is there just the same—but more of it is in the form of new equipment.

And here's another point: The dollar is stable today—but over the long pull, historically, prices go up. There's an advantage in buying equipment, for use in the years ahead, with dollars of today.

Some of you may say, "A company can't possibly get enough out of its depreciation allowances to keep its plant modern. That takes new money."

That was true a few years back—but the picture is greatly changed today for two reasons:

1. A new depreciation policy is now in effect in the Internal Revenue Department. Bulletin F is not to be used as a "rule book," but merely as a general guide, and obsolescence as well as age is to be considered in determining the permitted write-off period.

2. The Internal Revenue Act of 1954 contains various options under which depreciation can be accelerated. For example, by electing to use the "sum of the digits" method, a company can write off about three-fourths of the original cost of the machine in the first half of the write-off period.

This means that a company investing capital in new equipment may do so with the expectation of recovering the major share of the capital during the period of reasonably foreseeable risk.

The constructive course of action today is a survey of equipment and facilities, from the standpoint of maintenance as well as cost reduction, to determine (1) what should be replaced and (2) the sequence.

This will lead to the setting up of an itemized replacement program, and a time-table which can be related to the depreciation allowance, balance sheet, surplus account, profit forecast, and cash forecast.

A consistent program of replacement and modernization is an integral part of any sound over-all cost reduction program. Don't wait until the shoe begins to pinch!

Round Table

Busybird

"That new man you recommended so highly turned out to be one of those frustrated crackpots, Al. He's bothered me all morning with idiot schemes to increase production, and I'll give you odds that he doesn't get the die job I gave him done in a week, if ever."

"What's the matter with a few good ideas, Ed? Ankers can probably suggest a lot of things that we can use. He used to work in some very big shops."

"Well, I may ask him to go back to one of those big shops, Al. I don't mind somebody thinking up a new idea or two, but I'd like to see it on a suggestion blank, instead of having to listen to such wild enthusiasm. Frankly, Al, I suspect he had to leave his last job because he was too full of ideas—and not of work."

"He's not a bad cuss, Ed. Give him a chance. He'll probably settle down in a few days."

"I'll give him a fair break, Al, but I'll admit that up to now he has me worried. I don't think he's spent a third of the day at his own bench. And some of the other men are getting a little nervous about him, too."

"They're just afraid he'll find out how sloppily they do things and force them to change."

"Look, Al; I'll admit that what you say may be partly true. Some of the old timers in my department don't *want* to try anything new. But it's still a fact that one high-powered eager beaver like this Ankers can sour a whole department. I've seen it happen, and if this guy is likely to do it, I'll get rid of him."

"Maybe it might be a good idea for you to explain about our suggestion system and how it works, Ed. Maybe he doesn't realize that it exists."

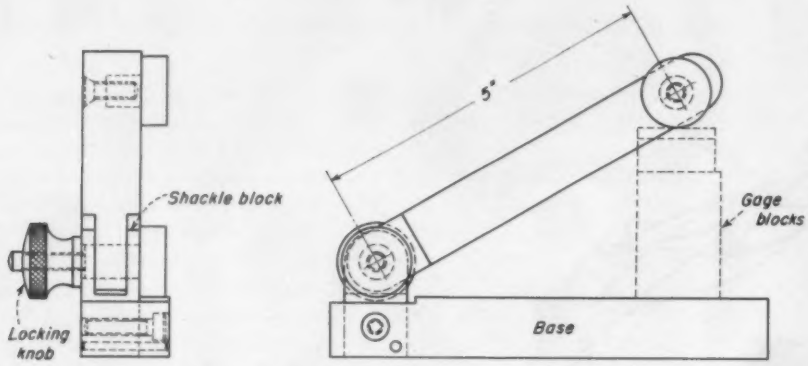
"Oh, doesn't he, though! Every third word I've heard out of him was 'award,' and I can see the dollar signs glinting in his eyes."

"Don't let his enthusiasm get you down, Ed. He's liable to come up with a real money saver."

"Sure, sure, and I'm the king of Siam."

***IS THE EAGER BEAVER** a blessing or a threat to a good shop? Is Al right in suggesting that the old guard could stand a little shaking up? Have you ever run across a similar situation? Your opinions may help others. Discussions of earlier topics start on page 204.*

Practical Ideas . . .



Precision Angle Gage Uses Sine-Bar Principle

Shown here is a useful precision angle gage for the machinist or toolmaker. The gage simplifies work settings where better accuracy is required than is possible with an ordinary protractor, which can, at best, be set only to degrees. The gage shown here can make angular settings to limits of ± 0.0005 in.

The tool uses the sine-bar principle, but, of course, does not have the same fine degree of accuracy. The tool consists of a hardened rectangular base which is ground flat and parallel. A shackle block, secured to the base by a capscrew and hardened dowel, is located so its rear side lies flush with the rear face of the base.

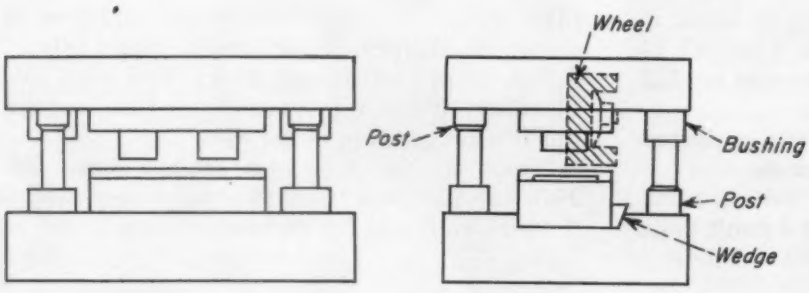
The upper end of the shackle has a slot into which is fitted the lower end of the sine bar, which pivots on the shank of a headed stud. By tightening the knurled knob at the rear of the device, the bar is locked in any desired angular setting.

A small stop pin passing through the head of the stud and side of the shackle prevents the bar from turning when the knob has been tightened.

The largest parts of the studs at either end of the sine bar are ground to exactly 1 in. diameter, and their center-to-center distance is exactly 5 in.

In use, the bar is set with gage blocks, as shown. The required height of the blocks is easily found by multiplying the sine value of the desired angle by 5 in., to give the vertical height.

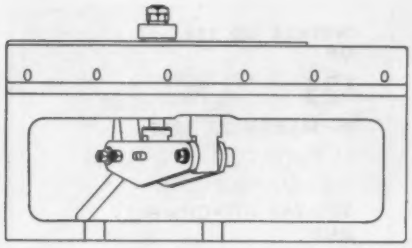
This gage is especially convenient for checking angle templets, form tools, and tapered bars, because both members of the gage are flush at the rear, and the tool may be laid flat on a surface plate of piece of ground glass. Then the angular edges of templets may be viewed against the inclined sides of the sine bar, or, once the gage is set to the desired angle, tapered work may be laid on the flat top edge of the base and checked against the under side of the bar, using ordinary feeler gages or layout dye. *W M Halliday, Lancashire, England*

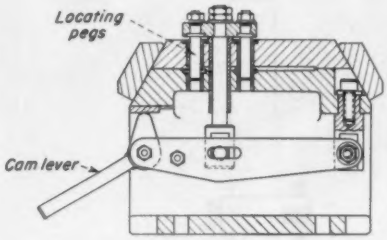


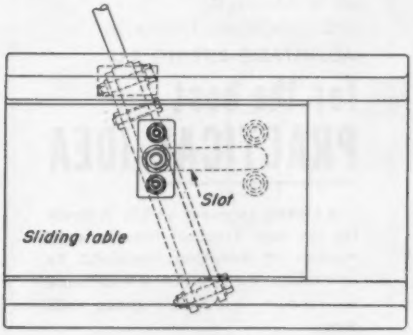
Another Inverted Dieset

We were very interested in the inverted dieset (*AM*—Feb 14, '55, p155), because we have sometimes used the same idea. However, we have found a modification of the design suits our purpose, and works a little better than the idea as you have shown it. Ordinarily, the punch plate is thinner than the die holder, so that long guide posts cannot be fixed sufficiently rigidly in the punch holder.

Therefore we use semi-inverted diesets instead of the fully inverted dies, with 2 of the posts in the upper die, and 2 in the lower. The die can still be reground as with fully inverted diesets, but the die is given added rigidity. Also, in the case of wedge-clamped dies, the die area need not be as great as with the fully inverted dies, because two of the bushings (which have a larger diameter than the posts) are in the upper section. Use of a cup-type grinding wheel saves even more area. *Tsugunosuke Kikuchi, Osaka-fu, Japan*







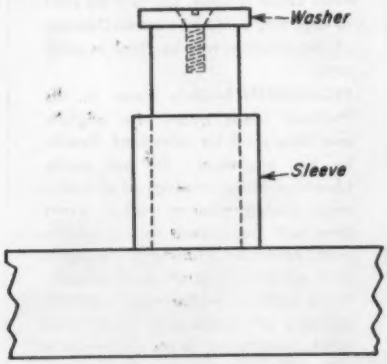
Two-Station Boring Fixture For Close-Tolerance Holes

Tolerance of center-to-center distance of two holes on a part we had to bore was ± 0.0005 in., and we did not have a two-spindle boring machine available, so we designed and built the fixture shown here to do the job.

The fixture consists of a sliding table on which the work was clamped. One hole was bored with the fixture in the position shown. Then the cam lever was moved upward until the cam face contacted the stop pin. Further upward movement disengaged the location pegs from the first set of location bushings.

The table can then be moved sideways, by moving the cam lever until the guide bushing comes to the end of the slot in the fixture. (This slot also provides rough location, by allowing a slight overrun of the location pegs with respect to the location bushings.)

When the cam lever is pressed down, the location pegs enter the bushings, giving accurate location of the table in the second boring position. Further downward pressure on the lever clamps the table, eliminating vibration. *J B Rose, Warwickshire, England*

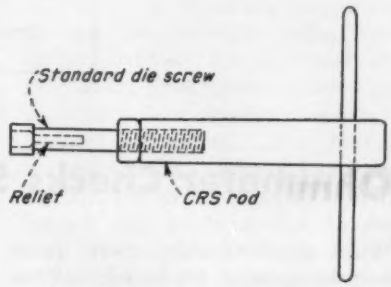


Sleeve Converts Press Stroke

Some time ago we had to notch the legs of an aluminum channel, prior to bending. To do this with our existing dies, we needed a punch press with a maximum stroke of 1 in., while all our presses had 2-in. strokes.

To convert to the 1-in. stroke, we used this method. A 1-in.-diameter shank was substituted for the original 1½-in. shank in the dieset. A sleeve was turned to a sliding fit on the 1-in. shank, with an OD of 1½ in. The sleeve was made 1 in. shorter than the shank of the dieset.

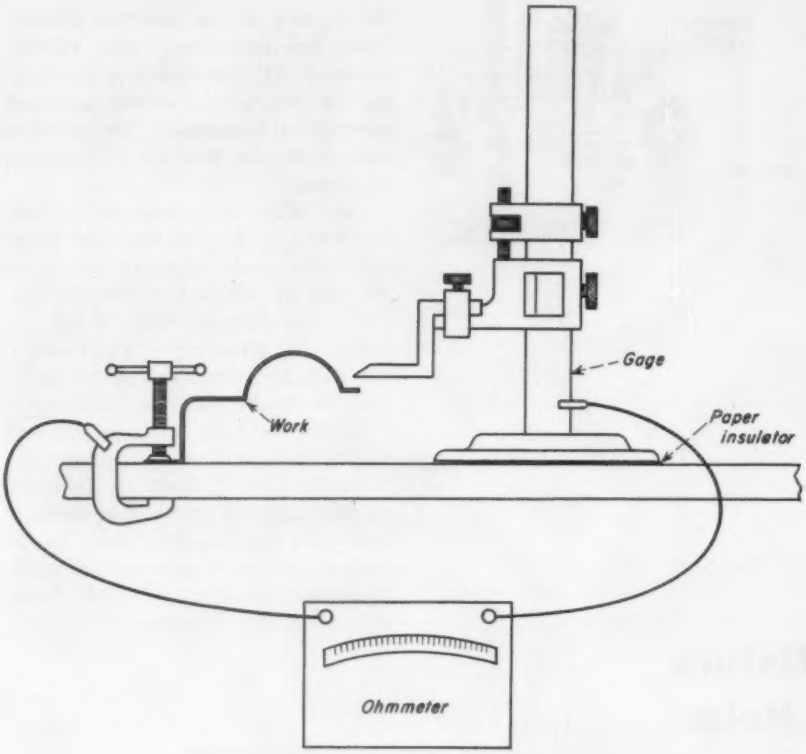
In setting the press, the sleeve is first set flush with the bottom of the ram. As the ram ascends, the sleeve slides on the shank until it contacts the washer, at which time the die opens and raises the punch for the remainder of the stroke. On the down stroke, the reverse is true. The ram descends until it meets the dieset, and then closes the set for the rest of the stroke. *Fred Hoare, factory superintendent, Mulholland-Harper Co, Philadelphia 24, Penna*



Shop-Made Emergency Wrench

A simple socket wrench for odd sizes can easily be made by drilling and tapping a piece of CRS, the tapped hole being chosen to receive a die screw with a hex-head recess of the desired size. The other end of the CRS rod is drilled for the "T" handle, and the tool is made.

The screw should be drilled, as shown, to provide clearance for the bolt of the piece being worked on. This kind of wrench is especially handy for turning and removing threaded hole-center transfers. One advantage of the T handle is that it can be made long or short to permit its use in otherwise inaccessible places. *Earle H Lewis, Jr, toolroom machininst, Synthane Corp, Oaks, Penna*



Ohmmeter Checks Strip Metal

When checking sheet-metal parts and flat springs, we found that too much time was being taken in inspection, and no two men could get exactly the same measurement. This was because the flexible metal would deflect under load, and inspectors with different "feel" would get different readings.

To avoid this trouble, we made the setup shown. With the height gage insulated from the surface plate, the meter, in series with the gage and work, only registers a "closed circuit" when contact is made between height gage and workpiece. *George A Jonas, Glen Oaks, NY*

Angular Shear on Piercing Punch

Double angular shear on a piercing punch worked very satisfactorily when using a hand arbor press piercing ⅛-in. mild steel stock. Balanced cutting action gives a sort of rotary shearing effect, which does not reduce the power required, but it does reduce the peak load during cutting, and minimizes "snapback." The design of punch is not suitable for blanking operations, as there is considerable distortion of the blank. *H J Gerber, Stillwater, Okla*

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JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

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WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

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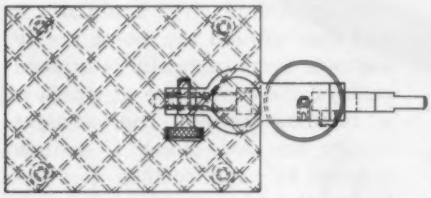
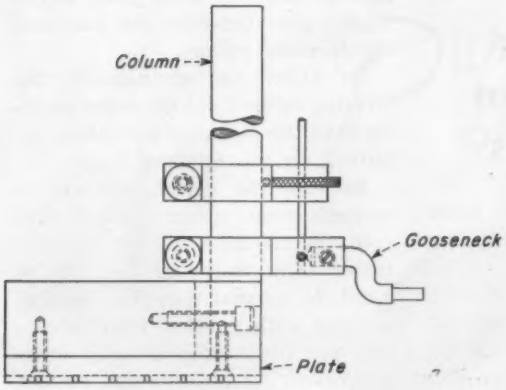
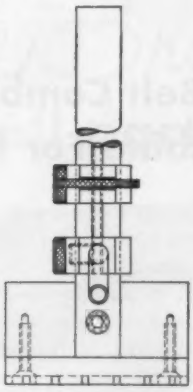


Top view



Side view



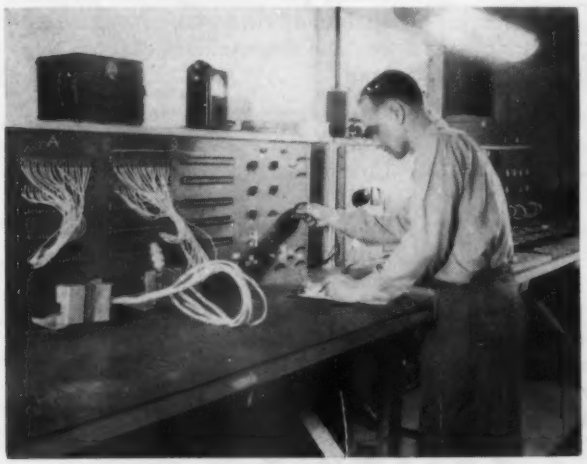
Rigid Surface Gage

Shown here is a combination surface and height gage which combines the good features of both. It is used when checking work which is to be measured to a tolerance of 0.0001 or 0.0002 in. To check such parts, the indicator used on the gage must repeat its reading regularly when checked over gage blocks. Also, the gage must be rigid enough to avoid vibration, which often occurs when the surface to be checked is more than 6 in. above the surface plate.

Also, when working from the underside of a surface with a conventional surface gage, the pressure of the rocker arm is against the spring, not against the adjusting screw, as is the case when working from an upper surface. This has a tendency to cause the indicator reading to vary—not much, of course, but enough to cause a certain amount of doubt when the tolerance is close. With this gage, the indicator will repeat equally well from either upper or lower surfaces, as there are no springs, and all adjustments are equally reliable.

The bottom plate is of machine steel, pack-hardened and the bottom surface has cross-grooves 1/32 x 1/32 in., ⅜ in. apart, to prevent dirt or other foreign matter from coming between the gage and surface plate. These grooves were put in with a thin grinding wheel, to prevent distortion. The bottom surface should also be ground after assembly with the base, and hand-lapped until perfectly flat, to prevent rocking when in use.

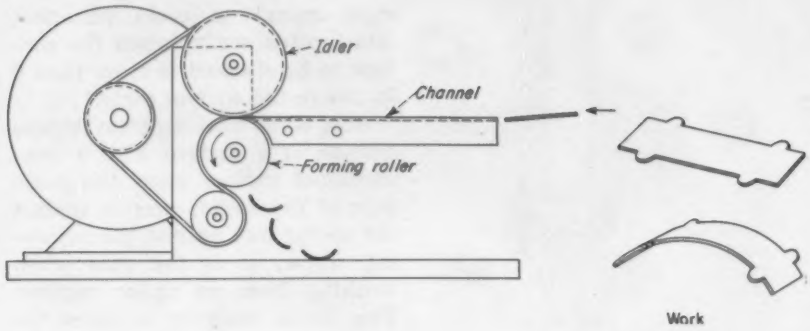
The gooseneck must be made to suit the particular kind of indicator being used. *Allan B Nixon, Springfield, Mass*



LP Record Cuts Test Time 89%

In checking out a complex cable for circuits after assembly, the practice was to follow a sequence listed on a direction sheet, as shown here. Connecting switches were set as shown on the sheet, and the circuit was tested and checked off. The system worked, but required about 2¼ hr per cable.

To speed up checking, the entire sequence was dictated onto an LP record, so the instructions could be played back to the inspector. The first time this method was used, the man checked a circuit in 8 minutes! This was too fast for normal pace of work, so the record was remade, with suitable pauses to run 15 min, to allow the inspector time to make connections. *Raymond R Wiese, Bristol Engineering Co, Bristol, Penna*



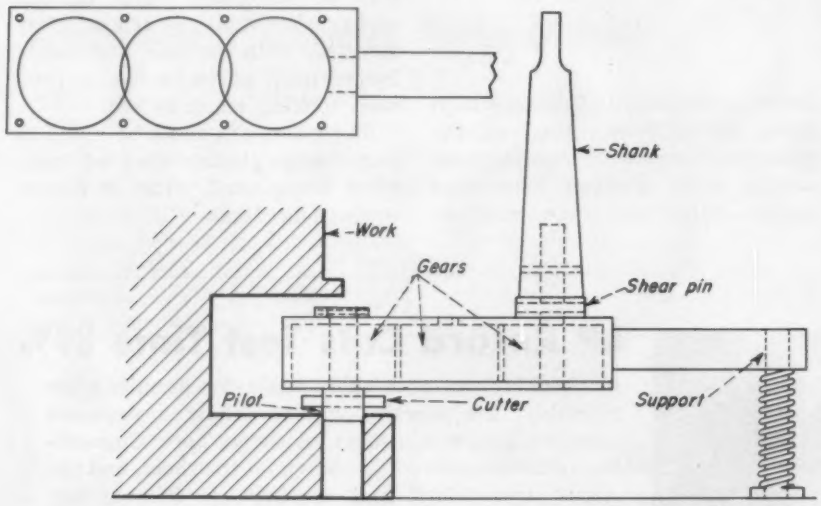
Forming Roller and Belt Combined in Simple Bending Machine For Blades

Blades for a simple blower were blanked out with a progressive die, with four lugs which were bent over circular cheek plates during assembly. Before assembly, the blades had to be curved, and it was found that incorporation of the bending operation into the press tools would complicate these tools and add considerably to expense.

It was decided, then, to make a separate operation out of curving the blades, for which we made the simple machine shown here. The basic machine is a 1/3-hp electric motor standing on a baseplate. A belt runs around the motor pulley and over three vertically positioned pulleys, the center one of which is a forming roller. The straight blanks are fed along a shallow channel by hand, so they pass between the top idler and forming roller. The belt sandwiches the blanks between its inner side and the outer surface of the forming roller, and then expels the curved blades. Bending takes place as the blades pass between the belt and the forming roller.

To allow for springback, the forming roller has a diameter smaller than the radius of curvature required on the finished blade.

Because the motor revolves at a synchronous speed of about 1500 rpm, the machine will bend blades faster than they can be fed by hand. In normal use, the machine is fitted with a guard which keeps the operator's fingers away from the revolving pulleys and rollers. *C T Bower, London, England*



Gear Train Helps Spotfacing

We recently had a repetitive job which called for spotfacing four holes in a flange of a workpiece which could not be handled easily because of its size. The normal method of doing the work would have meant uphill facing in a radial drill, but we avoided this by making the setup shown here.

Essentially the idea is to have three gears to transmit motion from the spindle of an ordinary drillpress to a piloted cutter which enters the hole already drilled. The gears were supported at either end in lid and base, while three holes were machined in the body of the device, to make room for gears.

A spring-loaded pin anchored in the machine table prevented the gearbox from spinning around. A shear pin through the tapered shank and first gear drove the cutter. *T A Cranfield, Yorkshire, England*

Emery Cloth Removes Splinters

Coarse emery cloth rubbed briskly over the splinter will remove almost any metal splinter without pain. The method, even though it sounds outlandish, is effective practically every time.

The cloth should be no finer than 60-grit, and must never have been used on metal. *J. H. Sperman, Sperman Metal Specialties, Brooklyn, N.Y.*

Lower Cost per piece with Surface Broaching of small parts

■ Holding fixtures are designed for quick, convenient loading, with automatic clamping and unclamping.

■ In many plants where large quantities of duplicate metal parts are being machined, substantial savings are being made through the adoption of surface broaching. Production is exceptionally high, close tolerances are maintained, and tool maintenance costs are much lower than with ordinary methods. Foote-Burt engineers, pioneers in this advanced machining method, have had a wide experience in applying surface broaching in many fields.

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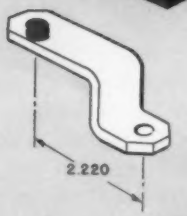
These can all be broached AT FAR LESS COST on Red Ring Self-contained Broaching Fixtures. Use your standard broaching machines for the heavier jobs on which they pay off.

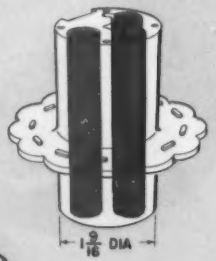
The Self-contained Fixture has its own pneumatic power unit to pull or push the broach. Just set it on a table, connect it to the air line and you are ready to start broaching. Or you may want to mount it vertically to further economize floor space.

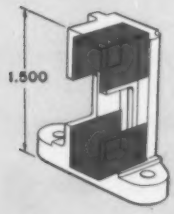
Like other fixtures or dies, these units may be stored in the tool room when not in use. They occupy little space and are easily portable.

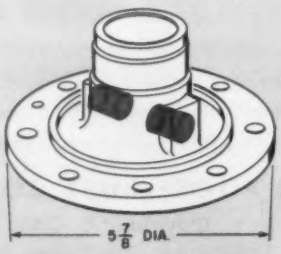
Application is practically unlimited for jobs requiring a "Pull" of 2,000 lbs. or less and a stroke not exceeding 25 inches.

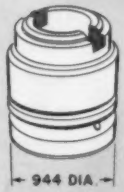
Call a Red Ring Broach Engineer or write for Bulletin B54-9 for more detailed information.

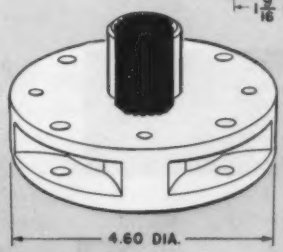


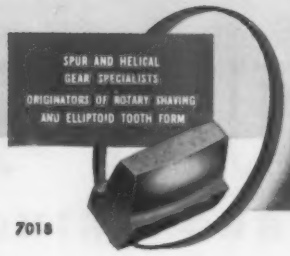












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WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

American Machinist REFERENCE BOOK SHEET

SPEEDS AND FEEDS FOR CARBIDES

Courtesy Carboloy Dept, General Electric Co

CUTTING NON-FERROUS AND NON-METALLIC MATERIALS—AVERAGE WORK

MATERIAL TO BE CUT		POWER CONSTANT	7/16" to 3/4" Cut .020" to .030" Feed		3/16" to 3/8" Cut .015" to .025" Feed		5/64" to 5/32" Cut .010" to .020" Feed		1/64" to 1/16" Cut .008" to .012" Feed		.005 to 1/64" Cut .002" to .008" Feed	
			Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade	Speed F.P.M.	Carbide Grade
BRASS AND BRONZE	Hard	8	100-250 **200**	44A	125-275 **225**	44A 883	150-350 **275**	883	200-400 **350**	883 905	300-600 **450**	883 905
	Soft	4	150-300 **250**	44A	175-325 **275**	44A 883	200-400 **325**	883	300-500 **450**	883 905	350-1000 **550**	905 999
	Free Cutting	3	200-400 **300**	44A	250-450 **350**	44A 883	300-600 **450**	883	500-750 **600**	883 905	700-1400 **850**	905 999
ALU-MI-NUM	Low Si.	2	175-325 **250**	44A	200-500 **300**	44A 883	250-600 **350**	883 905	300-1500 **500**	883 905	500-2000 **700**	905 999
	Hi. Si.	4	100-175 **125**	44A	100-250 **150**	44A 883	125-300 **175**	883 905	150-750 **250**	883 905	250-1000 **350**	905 999
ZINC ALLOY	Die Castings	3			200-500 **300**	44A 883	250-500 **350**	883 905	300-600 **450**	883 905	400-1000 **600**	883 905
RUB-BER	Hard				250-450 **350**	883	300-500 **400**	883 905	350-600 **475**	883 905	400-8000 **600**	999 905
	Soft				300-600 **450**	883	400-800 **550**	883 905	500-1000 **650**	883 905	600-1200 **800**	999 905
COP-PER		4	100-300 **200**	44A 883	150-350 **250**	44A 883	200-500 **350**	883 905	300-600 **450**	883 905	400-1000 **600**	905 999
MONEL METAL		12			175-275 **225**	370 44A	200-275 **250**	370 350	200-300 **250**	350 370	225-325 **275**	350 78
FIBRE					250-500 **350**	44A 883	300-800 **450**	883	400-1000 **600**	883 905	500-1500 **800**	905 999
PLAS-TICS					250-500 **350**	44A 883	300-800 **450**	883	400-1000 **600**	883 905	500-1500 **800**	905 999

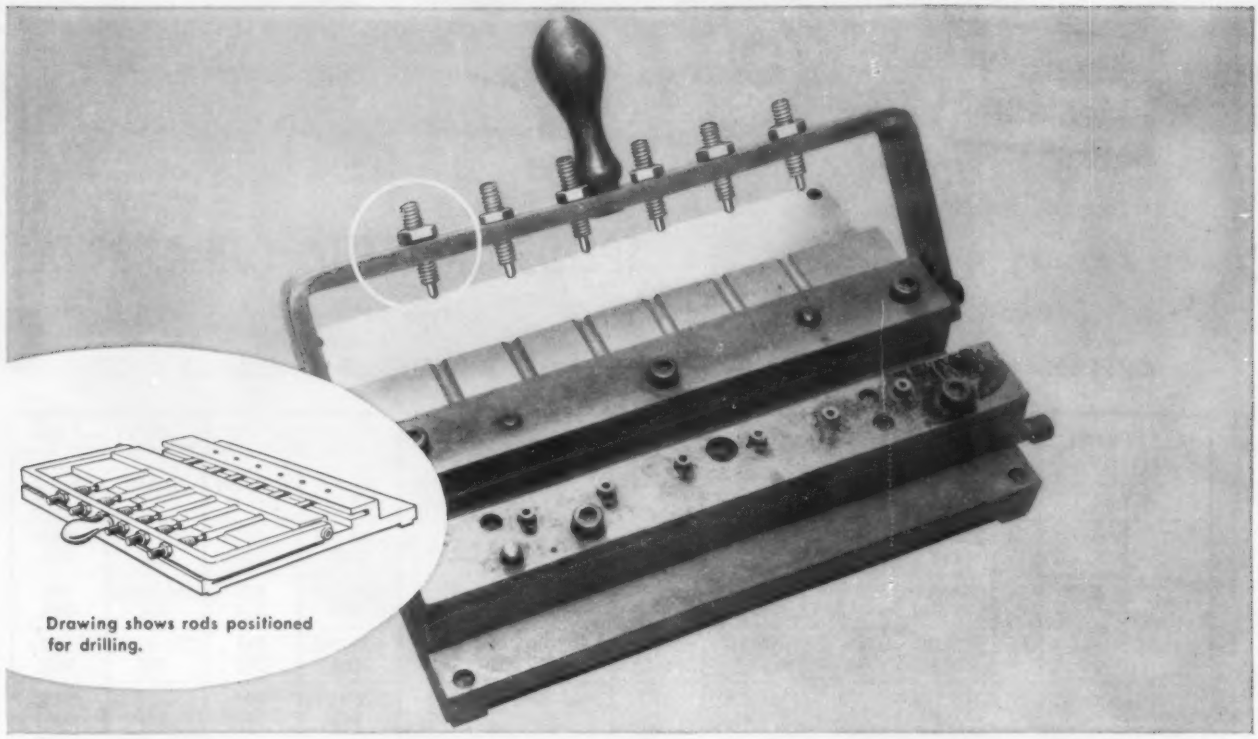
CUTTING HEAT RESISTANT ALLOYS—AVERAGE WORK

MATE-RIAL TO BE CUT	7/16" to 3/4" Cut .020" to .030" Feed		3/16" to 3/8" Cut .015" to .025" Feed		5/64" to 5/32" Cut .010" to .020" Feed		1/64" to 1/16" Cut .008" to .012" Feed		.005" to 1/64" Cut .002" to .008" Feed	
	Speed F.P.M.	Car-bide Grade	Speed F.P.M.	Car-bide Grade	Speed F.P.M.	Car-bide Grade	Speed F.P.M.	Car-bide Grade	Speed F.P.M.	Car-bide Grade
Inconel X	–	–	30-50 **40**	44A 370	40-60 **50**	883 350	50-70 **60**	883 905	60-80 **70**	999 905
Nimonic Alloys	–	–	40-60 **50**	44A 370	50-70 **60**	883 350	60-80 **70**	883 905	70-90 **80**	999 905
S-816	–	–	30-60 **40**	44A 370	45-65 **50**	883 350	50-70 **60**	883 905	60-80 **70**	999 905
Timken 16-25 6	–	–	75-125 **100**	370 44A	85-150 **115**	350 883	100-160 **130**	350 905	125-225 **160**	831 905
Titanium Com. Pure	50-90 **75**	44A 370	100-150 **125**	44A	150-250 **200**	883 44A	200-300 **250**	883	250-350 **300**	999 905
Titanium Alloy	25-75 **50**	44A 370	50-100 **75**	44A	100-175 **125**	883 44A	100-200 **150**	883 905	150-300 **200**	999 905

NOTES:

1. Suggested speeds for average conditions are shown in bold-face type. To meet requirements of specific jobs, speeds can be adjusted within speed ranges indicated by light-face type.

2. Carbide grade for average work is given in bold-face type. The grade in light-face type is an extra selection when abnormal cutting conditions are encountered.



How to spread the profits on a sandwich jig

Ready-made Vlier Spring Plungers eliminate costly "home-made" devices; provide accurate, pre-set end pressures

The sandwich-type drill jig shown above demonstrates a typical application for Vlier Spring Plungers. Six Standard-nose models are used to locate cylindrical parts until the top of the jig can be positioned securely for the drilling operation.

There are probably a dozen similar applications in *your* tool room where these handy, precision tools can save money. They're now widely used in all industries for positioning parts in jigs and fixtures, breaking oil seals and ejecting parts from punch press dies, as detents, in end product applications—*wherever constant, accurate spring loads are needed.*

MACHINED TO CLOSE TOLERANCES

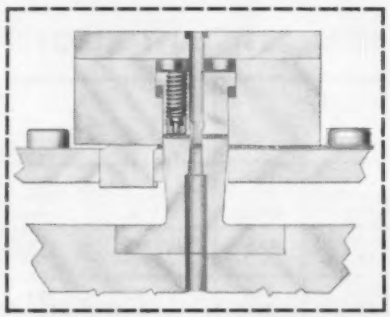
Vlier Spring Plungers are simple tools, carefully designed and manufactured to give years of service. Large bearing surfaces between the plunger nose and the body assure perfect alignment of the plunger nose at any extension. Close tolerances prevent binding and wobble, assuring smooth travel of the plunger nose over its full length. The tool is so designed that the plunger nose telescopes completely, permitting the tool to be used where mating surfaces must be flush.

SOFT CORE MINIMIZES FRACTURING

Case hardening the plunger nose gives it extremely good resistance to wear. However, the core remains ductile, overcoming brittleness and the hazards of fracturing under impact which is common with hardened, high-carbon steels.

EASILY INSTALLED OR REMOVED

Installation of Vlier Standard-nose Plungers is quickly accomplished with a simple spanner-type wrench. Adjustment of the Hexnose type is even simpler, since a standard end or box wrench can be used.



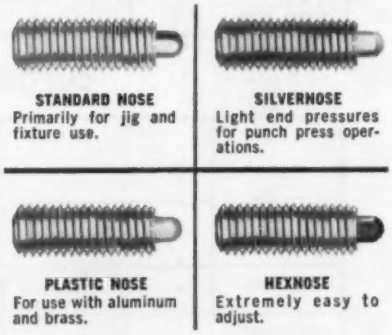
Thousands of Vlier Silvernose Spring Plungers are used in punch press dies to break oil seals and eject parts. Special springs, developed for fast, repetitive operations, give millions of flexes without crystallizing.

Providing your tool engineers with a selection of these ready-to-use tools will speed jig, fixture and die manufacture, and insure uniform, accurate loading, resulting in fewer rejected parts.

Your Vlier distributor carries a complete line *in stock*. Why not call him now?

Four Nose Types Available

Wide variety of diameters and lengths.

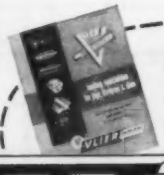


STANDARD NOSE
Primarily for jig and fixture use.

SILVERNOSE
Light end pressures for punch press operations.

PLASTIC NOSE
For use with aluminum and brass.

HEXNOSE
Extremely easy to adjust.



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VLIER ENGINEERING INCORPORATED

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SPRING-BACK CONTROL...I

DON R KING, tool engineering consultant

The problem of springback occurs in almost every bending operation. Even with dead-soft materials, springback may become serious where accuracy of the bend is required.

The pressure-pad type of wiped bend, Fig 1, is usually considered superior, but it is not always the complete answer. A point often overlooked is the rather high pad pressure required. This may be difficult to obtain unless a cushion is available in the press.

Standard formulas will give the approximate holding pressure, but in all cases the die should be tried out in "slow motion". If at any point in the bending stroke, a separation can be detected between the stock and the punch, more spring is needed. A relief angle on the punch, as shown, and a tight wiper setting are of some help.

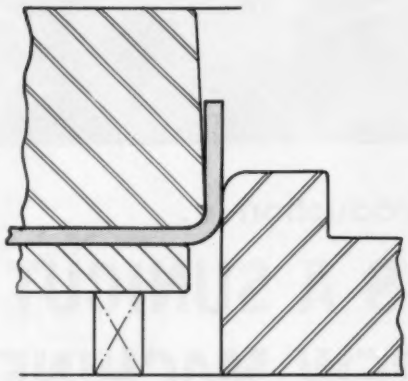


FIG 1

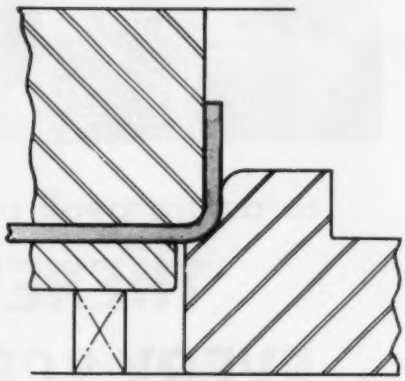


FIG 2

"SPANKING" THE BEND

Another means of giving a more definite "set" to the material is illustrated in Fig 2. Here "spanking" of the bend area occurs at the bottom of the stroke. Careful stroke adjustment is required to prevent abnormally high pressures. Some improvement may be gained by altering the spanking radius to reduce the area of contact, but this partially defeats the purpose, and does not set the entire bend area.

One of the most satisfactory control methods is shown in Fig 3*a*. Here the pad and punch are constructed on an angle to compensate for the amount of springback. Uniformity of bends is good and not affected by the press stroke. As applied to channels, Fig 3*b*, this method is limited to combinations of channel width and material thickness that will not be permanently overformed by the compensation.

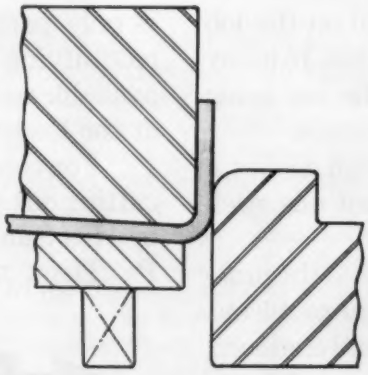


FIG 3a

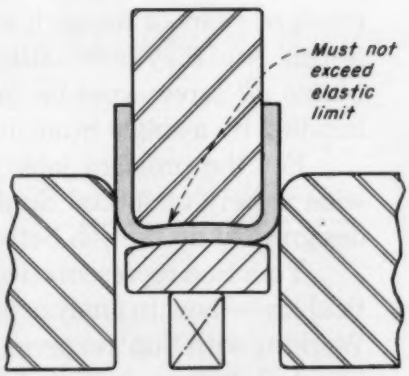
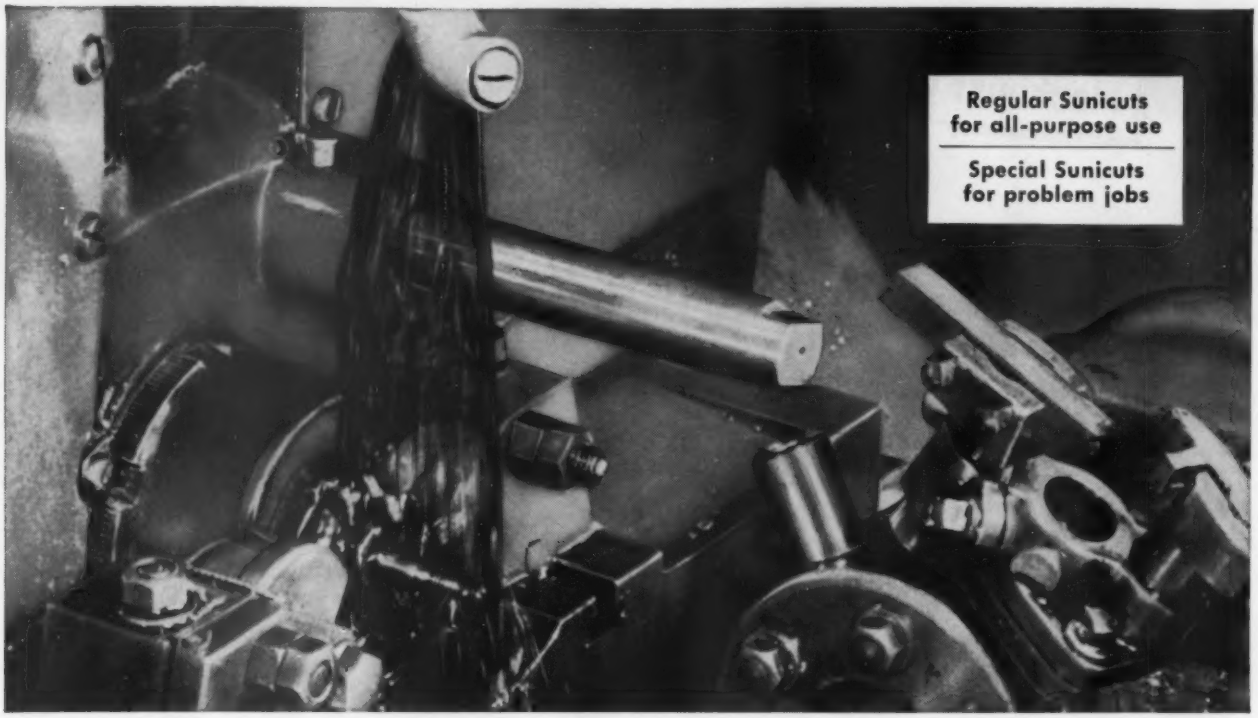


FIG 3b

The usual explanation offered for the superiority of the pressure-pad, wiped-type of bend is that the material is ironed or stretched. It seems doubtful that the friction involved can produce stretching, and ironing mostly takes place after the bend is complete. A more likely explanation is that the wiper block or the entire die yields, and after passing tangency of the bend, re-



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SPRING-BACK CONTROL...II

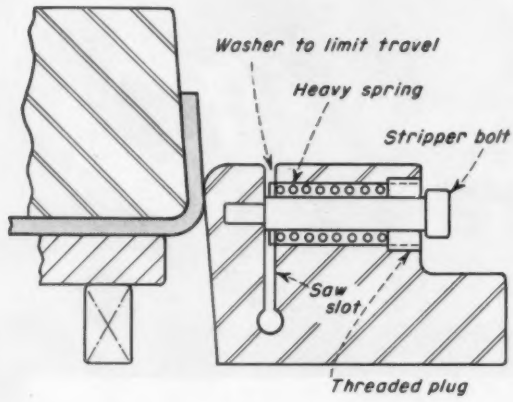


FIG 4

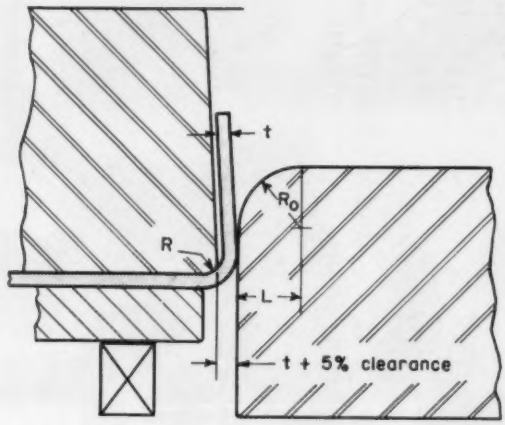


FIG 5

covery takes place and produces a small amount of overbending.

Extension of this reasoning led to the construction shown in Fig 4. Controlled movement of the wiper is introduced by means of springs and stops. The amount of movement required is very small. A few thousandths past tangency will correct a considerable angle of spring-back, and the simple spring-hinged wiper will be satisfactory in most cases. On light material, auxiliary springs may not be required.

Until now, we have considered only cases where the wiper is closely fitted, with stock clearance only, and have ignored the wiper-nose radius, as it has little effect under this condition. In Fig 5, a small clearance is provided between wiper and punch, in addition to stock thickness, and the wiper radius (actually length L) plays an important part in controlling spring back. When length L is in proper proportion, a small amount of "air bending" takes place at some point in the bending cycle. This is added to the formed bend, resulting in an overbend sufficient to counteract springback. The amount of overbend increases with an increase in L. It is also affected by the clearance, but it is easier to maintain this at about 5% of stock thickness and alter the nose radius. Exact dimensions will usually have to be determined by experiment. For a starting point, Table 1 shows the approximate dimension that will produce a slight overbend.

When the bend radius is large in proportion to stock thickness, the wiper radius becomes rather large. If space is limited, the nose contour shown in Fig 6 may be substituted. With this arrangement, L may be about 60% of the dimension for a plain radius.

table 1 . . LENGTH OF L TO OVERBEND

BEND RADIUS	LENGTH L
R = Sharp	4 t
R = ½ t	6 t
R = t	10 t
R = 2 t	15 t

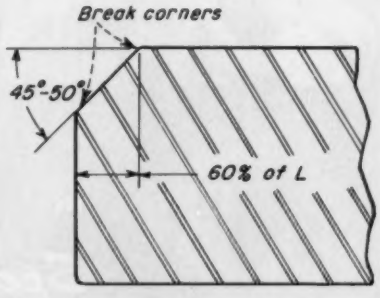


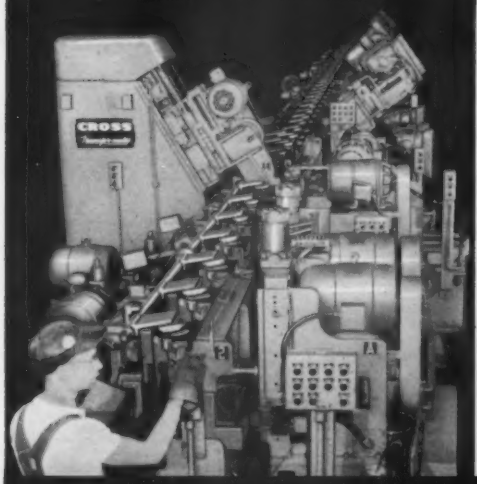
FIG 6

Warner Gear Reduces Downtime with Cross Machine Control Unit

A Mechanical Eye...

(U.S. Patent Nos. 2679038 and D-163935. Others Pending.)

At right, set-up man pre-sets tools at Warner Gear Division, Borg-Warner Corp. for Transfer-matic below.



"We are well satisfied with the results we have obtained from the Cross Machine Control Unit," says Emory Watson, Master Mechanic of Warner Gear Division of Borg-Warner Corporation.

Warner Gear's experience is typical of many users. Over 500 Cross Machine Control Units are successfully reducing costs of many metal cutting operations. Here's why:

Toolometers on the Machine Control Unit assure improved tool changing programs and maximum tool efficiency. Tools—pre-set with standard fixtures and gages to eliminate machine adjustments and trial cuts—are stored in the Machine Control Unit convenient and ready when needed. Results: Reduced tool costs . . . less downtime . . . higher operating efficiency.

You can get the same cost saving benefits as Warner Gear. Write, wire or phone The Cross Company for full information, today.

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Special MACHINE TOOLS

Talking Shop . . .

Sweet Job

SHIPPING a 250,000-lb turbo-generator to San Juan, PR, presented GE with an unusual loading problem. Because there are no suitable handling facilities at the port of arrival, the unit will be shipped as deck cargo on an otherwise empty freighter operated by Bull Lines, NY. To prevent shifting in transit, it will be welded to the deck, after bulwarks have been cut away to get it aboard.

On arrival, the deck will be high above the dock, so the holds will be opened and loaded with a return cargo of some 10,000 tons of sugar in 250-lb bags until the deck comes flush with the dock. Then the generator will be skidded ashore. To make this job easier, the cribbing in which the unit is shipped will be made of solid maple.

Bulwarks will be bolted back into place and the ship will make a routine return trip. Another job, well done, by your United States Merchant Marine.

Treed Aluminum

AUSTRALIAN SCIENTISTS have just discovered that certain trees there are making aluminum compounds in considerable quantity, and storing them as hard, white masses in the wood, bark and leaves. First ones found were considered freaks. But now the Plant Industry Division reports that some 80 different species store such compounds, including coachwood, prickly ash, smooth-flowered nut trees and blue beech. Presumably, the trees extract aluminum from the soil and store it here and there in pockets. But only trees in rainy areas do it—trees in dry areas store no aluminum at all.

Spark Brush

DANIEL PRESKA, at Textile Machine Works, Wyomissing, Penna, won a suggestion award recently with an ordinary scrub brush. He set it, bristles up, in a pan of water so it stays wet and put it under a grinding head on his lathe. It catches grinding sparks and dust.

Golden Lines

RYAN AIRCRAFT uses gold wire in automatic pencils for drawing master layouts on white-lacquered aluminum plates; and it costs less. The wire costs 84¢ per inch, and wears less than an inch per year. It produces a sharp, black line to 0.005-in. accuracy. Another unusual material used is glass cloth, which makes dimensionally stable tracings. These are laid on sensitized metal during the photo-reproduction process that "scribes" the metal for the guidance of the shop.

What's This?

AUTOMOBILE MANUFACTURERS most aggressive in adopting automation had the highest employment in history in the first quarter of 1955. Even so, it is becoming increasingly evident that automation has received attention out of proportion to its significance in the advance of all technology on a broad front.

Careful, Careful!

IF A MAN makes a successful improvement in his work routine or method and you say to him, "How come you waited this long to do that?" you are probably sounding the death knell for any future improvements in his effort. It's no credit to you, and it seems to reflect on his ability, when you look down your nose at his brain-child.

Flame Spray Ceramics

POWDERED CERAMIC MATERIALS can be fed through a simple flame gun to coat a wide variety of substances for greater resistance to heat and greater chemical stability than can be obtained by metal spray. Actually underlying metal has been melted without causing coating failure, according to Armour Research Foundation of Illinois Institute of Technology of Chicago, where the process was developed.

Sintered layers of refractory and chemically inert materials such as aluminum oxide or zirconium oxide are applied in thicknesses up to about 10 mils. Coatings can be used on soft metals such as aluminum or die-cast alloys because high heating base metal is not required. These coatings can be used to protect against erosion in pump, fan and turbine parts, as well as for protection against heat. The zirconia coating is more refractory and inert than alumina, but somewhat more difficult to apply and somewhat softer. Residual porosity is 10-15%, so doesn't protect against chemical corrosion of underlying material. Co-spraying with softer materials will take care of this, however.

Anti-tear

CURRENT STORY in Worcester deals with the aircraft company rushing a new plane to completion. On first test flight, the wings fell off halfway down the runway. The president ordered engineers and test men to stay on the job and be ready for another flight in 48 hr. When the time was up, the same thing happened. Whereupon the president got on the public-address system and asked for a suggestion from any employee for a method to keep the wings on—promising to accept anything. The only volunteer suggested drilling 1-in. holes all around the edge of the mounting pads on the fuselage and the wing brackets. "For bolts?" asked the president. "No," said the suggestor, "just drill 'em and leave 'em, and the joint will stay."

The president was dubious, but kept his promise. The plane flew, and more than that, was reported on enthusiastically by the test pilot. So the president summoned the suggestor.

"Where did you get your engineering education?" he asked.

"Never had none," said the suggestor, "I quit school after the sixth grade."

"Well, what do you do here?"

"I'm a custodian—I clean up around, mop the floors and tend to things in the men's rooms. Matter of fact, that's where I got the idea. You know how toilet paper always has holes across it? Well, I noticed that it never tears there. I figured if it works on toilet paper, it would work on a plane."

THE "PEACE SCARE" What Happens to

"Don't let it worry you" says the Pentagon. The Eisenhower military program is geared for the long haul, and military spending will stay around $34 billion a year for at least five years. Besides, the government isn't going to "back up and let its fences down" just because of a few tentative peace overtures on the part of Russia and her satellites

WASHINGTON — Some businessmen and government officials have been speculating lately about a possible drop in U.S. defense spending —stemming from a real easing of world tensions. Russian and Chinese Reds have suddenly become more accommodating and less belligerent —note the Austrian Peace Treaty, the upcoming Big Four Conference, the cooling off in the Formosa Strait.

But few if any people in Washington think disarmament is in the works soon. The latest ruckus over gains in Russian air strength now puts the damper on the talk.

Opinion is summed up in this remark by a high official: "It would take a considerable number of peaceful actions by the Reds over a considerable period of time before anyone in his right mind would back up and start letting the fences down."

Certainly Congress—where budget-cutting pressure builds up quickly —isn't going in this direction.

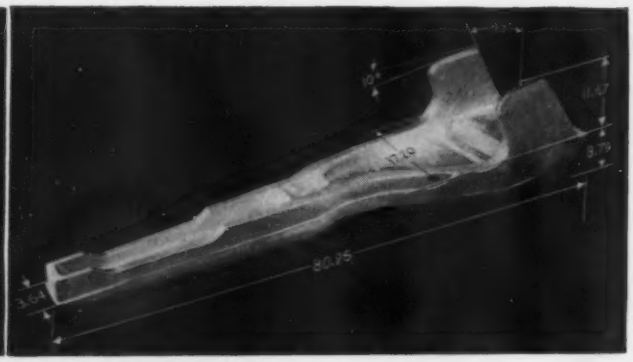
Last month, the House voted a $34.4-billion military budget for fiscal 1956. The figure is below the administration's $32.2-billion request. But the difference is mostly a matter of bookkeeping manipulations, not an appropriation cut. Indeed, the House had to beat down attempts by several Democrats to tack on additional funds and to restore manpower-cut planning for the military services over the next year.

The Eisenhower military program is geared for a long haul. This means stabilizing military expenditures at an annual level of about $34 billion for as long as five years. That's enough to keep up a total force of about 2.9-million men, a 137-wing Air Force, an active Naval fleet of 1000 ships (including 17 aircraft carrier groups), and an Army of 19 divisions, 18 regimental combat teams, and 117 antiaircraft battalions —all equipped with the most up-to-date weapons. Right now, this accounts for just about 10% of the Gross National Product and the total take of materials.

To be sure, some Washington officials fear that a few more honeyed words by the Russians about peace could stir up some public pressure for a slowdown in the military program.

Even if there's real substance to Moscow's latest peace talk, however, it would take a long time—maybe years—before Russia could adequately demonstrate its sincerity and lead us to start thinking seriously about military cutback. The crux of the matter is this: will Moscow agree to a general disarmament involving international controls and

Press-Bending a Thick, 360-Lb



As forged, with ears down . . .
COMPLETELY FORGED, but with ears flat, this 360-lb aircraft transfer wing spar is 80.25-in. long, 17.20 in. maximum width tapering to 3.64-in. minimum width, and 20.46 in. from base to top of ears. Sweepback of ears is 45°. Ear thickness at web is approximately 4 in. Because of the thickness of material mass, Wyman-Gordon found it impossible to bend the ears to the desired angle and dimensional accuracy using standard forging processes

. . . final operation—press bending
EARS ARE POSITIONED TO COMPOUND ANGLE by a special tooling setup in a 1500-ton press. Energy put into the metal in pressing and bending, along with proper grain flow, results in optimum mechanical properties obtainable only by forging.

How the methods compare . . . ➡
Chart at right shows comparative flow lines between the Wyman-Gordon method (top) and straight forging

Defense Industries If the Reds Go Soft?

inspection? Right now, most experts say this is inconceivable.

But if you want to assume that the Reds do have a real interest in easing the cold war, any military cutback on our part would be a slow and guarded one. For any meaningful estimate about where and how much military spending would shrink, you need some outline of the type of force limitations and arms prohibitions to be put into effect. In the absence of such facts, you can only speculate generally.

Here's how Pentagon experts look at it:

• First off, you know that a good chunk of military spending is directly keyed to the size of our force—military personnel costs, operations and maintenance expenses. If the size of the force were phased down, these costs would drop proportionately. For fiscal 1956, the first year in which a $34 billion spending level is projected, $18.1 billion will be tied up in such costs.

• Hard-goods procurement will take up $12.7 billion of the budget, with the bulk going for aircraft and an increasing amount for guided missiles. Relaxed world tension would mean a sharp cut in this, of course. But it would be a slow decline in plane and missile orders, based on the kind of peace established. In addition, the U.S. might spend as much as $8 billion a year just to keep our limited forces in good shape, and to handle obsolescence.

• Machine tool and other production equipment and facility expenditures will total about $668 million in fiscal 1956. This is already less than half the annual spending for this since Korea. A new world situation would bring an even more substantial cutback. Military research and development, however, would probably continue at the current $1.3 billion level.

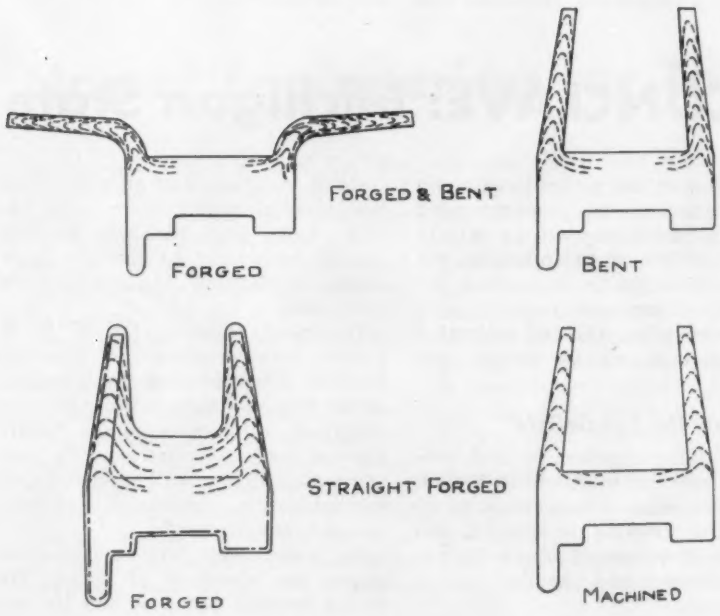
But whatever happens, it's not likely the present administration will let the military establishment fall below pre-Korea levels. By fiscal 1950, military spending had dropped to $11.9 billion (from a world war II peak of $79.9 billion).

Yet a drastic change in Washington leadership—either Republican or Democratic—in the face of a real peace could upset this assumption that there's any real minimum military force that the U.S. should have.

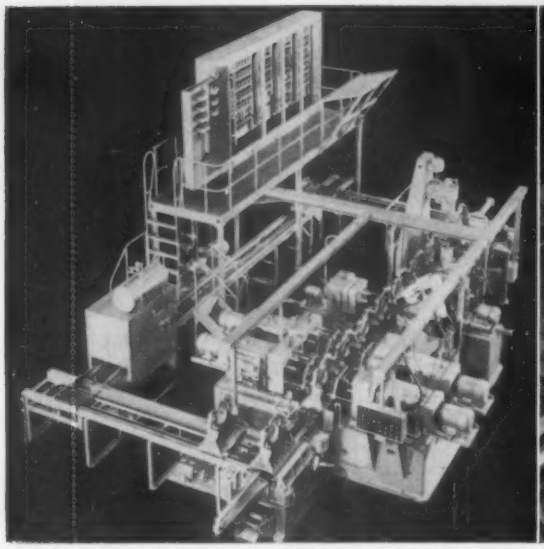
Planning Machine-Tool Replacement? Sundstrand Offers You a Calculator Free

ROCKFORD, ILL—If you're planning to buy new machine tools to replace obsolete ones, Sundstrand Machine Tool Co offers you free of charge a slide chart based on the Machinery & Allied Products Institute's replacement formula. Based on three primary steps, the slide chart takes into account installed cost of new equipment, terminal salvage value, primary service life, and other factors to give you a quick answer on whether or not it's worth your while to replace any given machine tool with a new one. The slide charts are obtainable **gratis by** writing on your company letterhead to J M Kjellstrom, advertising manager, Sundstrand Machine Tool Co, Rockford, Ill.

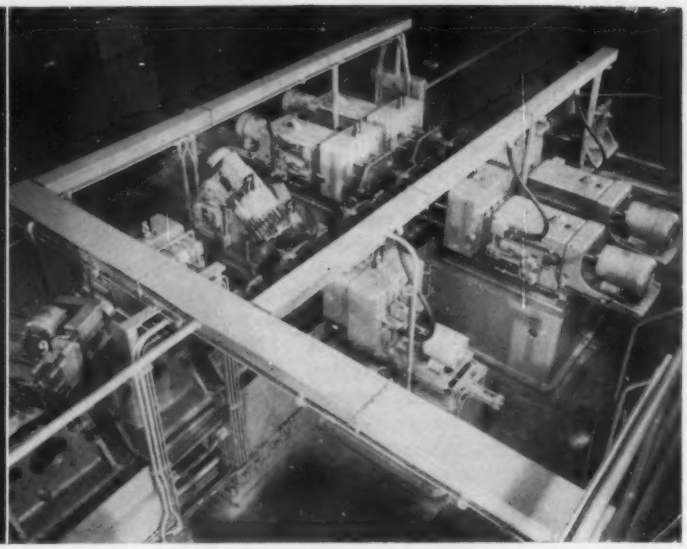
Aluminum Spar to Close Tolerances



NORTH GRAFTON, MASS—Maybe bending and upsetting a part during forging isn't new. But when that part is an intricate aircraft transfer wing spar AA7075 Al, weighing 360 lb—and its ears are bent vertically to critical dimensions at the final operation, without losing optimum physical properties—it's new. That's what Wyman-Gordon is doing with a spar completely forged on its 18,000-ton press, then shaping ears vertically on a 1500-ton press. This technique was developed because conventional methods couldn't do it. The results: material savings, superior physical properties, less costly machining, because ears are formed to slightly less than 90° of normal plane—eliminating draft and machining because the wings form the undercut.



COMPACT ARRANGEMENT of automatic transfer machine. Electric controls and hydraulic valving are housed in cabinet on mezzanine, hydraulic power pack is immediately below, on floor



SHEET-METAL DUCTS with removable covers give easy access to all electric wiring. Terminal strips at joints provide check points for trouble shooting, simplify dismantling and shipping

MADE-IN-CANADA AUTOMATION: 12-Station

TORONTO, ONT—Proving that it can now be completely independent of imported equipment, Canada has entered the automation field in a big way with a 12-station, palletized transfer machine capable of performing 5520 machining operations per hr on die-cast aluminum torque converter housings at Chrysler's Canadian plant. Built by Modern Tool Works Ltd, Toronto, the machine features unit construction for maximum flexibility to accommodate product changes or to permit complete retooling for a different component. This is an important step in the direction of standardizing such equipment to the point where tooling will eventually be the only special portion.

Work is clamped to special fixtures on a previously machined face and secured by clamps tightened by an impact wrench. The fixture base has hardened steel inserts in contact with the dovetail machine ways. Transfer mechanism is hydraulically operated, and fixtures are positioned at each station by hydraulically operated pins entering suitable bushings. Hydraulic clamps lock the fixtures at each position during the entire operation.

AUTOMATION CONCLAVE: Michigan State

EAST LANSING, MICH—Automation, the "Engineering for Tomorrow," appropriately enough keynoted Michigan State College's Centennial celebration engineering-wise. The occasion was MSC School of Engineering's Sixth Annual Engineering Symposium Series May 12-13. General sessions stressed the impact of automation on the U S economy, and surveyed automation from its early beginnings, and made some predictions for its future, too.

Opening session speaker Jerry Cunningham of Convair discussed automation equipment available for present-day processes. Pointing out that cost is the determining factor in whether or not you automate any given process, he recommended thorough preliminary study of: (1) production life of the machine, (2) number of shifts to be worked per day, (3) manpower requirements, before and after, (4) and estimated labor savings—all in dollars per year.

"Consult the Specialists"

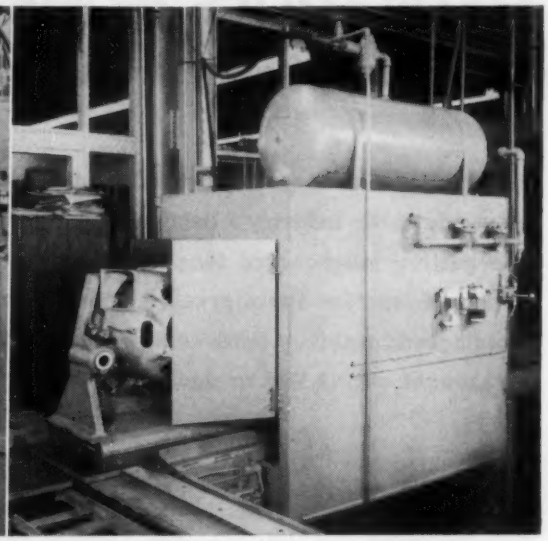
After this evaluation, he said, consult an automation specialist to talk over integration of operations, practicality of existing equipment, design and development of new devices and machines, and, finally, cost of automation.

After installation of an automated line, careful maintenance is necessary and constant improvement should be sought to reach a high degree of efficiency, Mr Cunningham concluded.

Luncheon speaker, Dr W R G Baker, vice president of General Electric Co, discussed "Automation as the Engineer Sees It." in which he described automation as the "addition of tools of programming and computing to the well-used tools of mechanization, mechanics, hydraulics and pneumatics."

In describing how automation raises our standard of living, Dr Baker pointed out that had its de-

IMPACT WRENCHES apply predetermined clamping pressure at three points to prevent distorting the work. Note guide bushings for accurate positioning of drillheads



BLOW-OFF STATION encloses work and fixture just prior to unloading. Powerful air jets blast off all chips to insure a clean fixture ready for reloading without additional cleaning

Unit Performs 5520 Operations per Hour

At the 12 working stations, 34 holes are drilled, 2 are reamed, and 10 tapped. When fixtures leave the machining section, they are carried around three sides of a square, sliding on composition strips to avoid excessive wear on the dovetail section. Just prior to unloading, the fixtures pass through a chip blow-off station where a manifold of air jets blasts off all chips so the work is clean and a clean fixture is ready for loading.

Chips and coolant discharge to a drag-type conveyor under the machine and are delivered to a Delpark unit which filters the coolant and discharges chips into tote boxes. All electrical equipment is mounted in control panels on a mezzanine directly over the machine to save floor space. Wiring is housed in overhead steel ducts. Valving for the hydraulic equipment is located in a cabinet on the mezzanine, and hydraulic power is provided by a power pack directly below this. Hydraulic piping is suspended immediately below the wiring ducts. Both hydraulics and electrics conform to JIC standards. All moving parts are grease lubricated at each cycle of the machine.

Hosts "Engineering for Tomorrow" Sessions

velopment been curtailed in the past, thousands of workers would not today be employed in electronics. Taking 1930 as a base year for the last quarter century, Dr Baker said machinery output has increased four times. And the U S Gross National Product has done the same.

The Economic Factors

Although retail prices have doubled, he said, average earnings for industrial employees have more than tripled. The number of hours worked each week has gone down, and the number of people working in industry is now double that of 25 years ago. And the number of workers performing hard, unskilled labor has been cut in half. Shorter working weeks give more pay for less work and more leisure time for the American worker.

To meet current economic demands, Dr Baker said, industry must be flexible enough to produce a wide variety of products. And it will have to have an even wider range of products five to 10 years from now. The answer is automation.

Research and Testing

Departmental sessions the afternoon of May 13 were on "The Automation of Mechanics Research and Testing," sponsored by MSC's Department of Applied Mechanics and directed by Asst Prof Paul J DeKoning; and a paper by Stanley C Clemence and Edwin S Peszynski of Timken's Detroit Axle Division on "Automation Applied to Heavy Duty Axle Testing."

Axle-Testing Developments

The authors discussed tests best suited to automation, and gave data on currently available equipment for this purpose. It is in routine testing of materials for production control, such as cycling and application of loads and determination of strength values, that automated testing comes into play, they said.

HYDRAULICS IN METALWORKING:

Industry Wants Them Leakproof, Fireproof, Standardized

With hydraulics becoming more important to Metalworking every day, the industry's demands on the hydraulic engineer are getting tougher and tougher—particularly in the design of machine tools, presses, and die-casting, injection molding and welding equipment. Here are some of the demands, as brought out at Vickers Inc's invitational forum

DETROIT—Some 150 design, maintenance and service engineers from 88 makers and users of metalworking machinery got together here May 17-18 at the invitation of Vickers Inc to talk over what they want in the way of hydraulically actuated equipment. It boiled down to three main demands: (1) fire-resistant hydraulic fluids, (2) leakproof connections, and (3) standardized hydraulic components.

Ford's Davis Keynotes Forum

Keynote speaker D J Davis, vice president manufacturing, Ford Motor Co, said hydraulics are a growing thing in industry. One Ford division alone, he said, used more than 500,000 gallons of hydraulic oil in second half 1954.

The magnitude of capital investment in hydraulic equipment warrants emphasis on improving seals and other components to eliminate leaks, Mr Davis said. And, he added, it's possible to develop low-cost nonflammable fluids.

The Forum Highlights

Here are the highlights of two days of technical discussion:

• **Standardization of components:** this is vitally necessary in almost every segment of hydraulics. For instance, fabricating machinery needs interchangeability of size and location of ports, mounting-pad configurations and dimensions. While no large-scale trend toward standardization of components is currently in evidence, the suppliers are said to be giving it some serious consideration.

• **Hydraulic fluids:** while experimental results are still somewhat inconclusive, present indications are that new water-soluble, fire-resistant fluids (oil-in-water and water-in-oil emulsions) will probably be limited to working pressures below 300 psi. One user reported fair results with a water-soluble type in a hydraulic-welding application in the 300-400 psi pressure range.

• **Components design:** manifolds, cylinders, fitting and tubing, heat exchangers and seals were all discussed in the second day's sessions. Advantages of various types of manifolds discussed brought out the merits of transmitting oil under pressure without pipe connections, thus saving space and promoting good shop housekeeping. Also discussed were ways and means of correcting troubles in brazed panels.

• **Leakproofing:** one large press manufacturer claims successful welding of pipe to flanged connections to produce a no-leak joint. A pickling operation following welding removes scale formed on the pipe's ID during welding, and piping runs are thoroughly stress-relieved after welding. Silver soldered joints were also cited as a good means of controlling piping leaks. Induction heating was recommended for soldering as an ideal way to achieve minimum fitting distortion.

One highlight of the conference was an announcement that a leading auto manufacturer has established his own standards of dimensions, tolerances and construction features for the manufacture of oil-hydraulic cylinders. This firm's program, started a year-and-a-half ago, is aimed at improving cylinder life, and at producing dimensional interchangeability.

MDNA Names 89-Year-Old St Louisan "Machinery Dealer of the Year"

CINCINNATI—Charles L McDonald Sr, 89-year-old St Louis machinery dealer, who has been in the machine tool sales business for 68 years, was named the outstanding machinery dealer of 1955 by the Machinery Dealers National Association at its 14th Annual Convention, held here May 23-26. He heads McDonald Machinery Co, whose history antedates the Civil War, when his father outfitted the Monitor for its battle with the Merrimac.

Mr. McDonald entered his father's business in 1887 and began building up a trade in surplus and used machinery—at that time a highly speculative line of business.

Three Generations in Firm

In 1920, Mr McDonald formed the present McDonald Machinery Co, with his sons as partners. Today, the firm represents three generations—Mr McDonald, his partner sons, Charles, Jr, and Robert, and a grandson, Don, who is a salesman and engineer.

Mr McDonald today is as active as when he pioneered in the used machinery business 68 years ago. Throughout his career, he has been active in establishing ethical standards of conduct among dealers, and was instrumental in the formation of the Machinery Dealers National Association at the outbreak of World War II. He was a charter member of the board and later treasurer of the Association.

Charles L McDonald, Sr

NEW ORDERS for MACHINERY:

McGraw-Hill Index Shows How Component Orders Fluctuate

American Machinist readers have asked "just what types of machines make up the McGraw-Hill Index of New Orders for Machinery?" And they've asked "how do orders for each compare with the overall Index?" Here are the answers—six in all. Some components, like Metalworking machinery, dropped off in April. Others, like engines and turbines, hit a long-time high

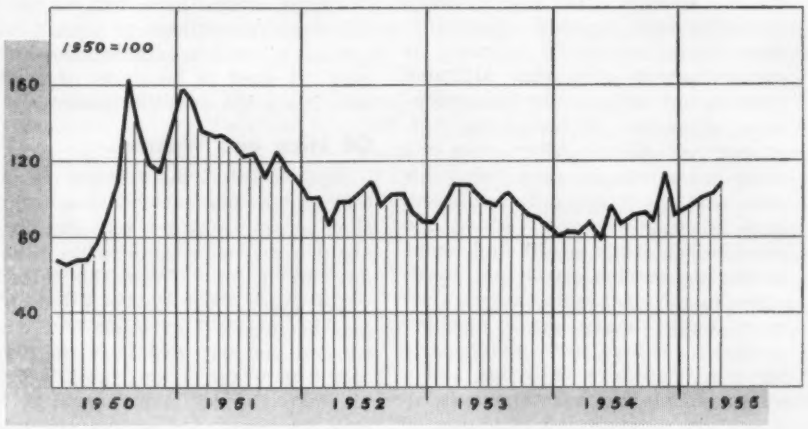
NEW YORK—In response to reader request, the McGraw-Hill Department of Economics has prepared a breakdown of the six component types of machinery new orders that make up the McGraw-Hill Index of New Orders for Machinery (except electrical) that has appeared in American Machinist since March 1954. The six component types of orders are for: (1) engines and turbines, (2) pumps and compressors, (3) construction and mining machinery, (4) metalworking machinery, (5) other industrial machinery, and (6) office machines.

How do new orders for each of the component types compare with the overall index? Details are on the chart (below right). Within their respective frames of reference, here is how each did in April of this year:

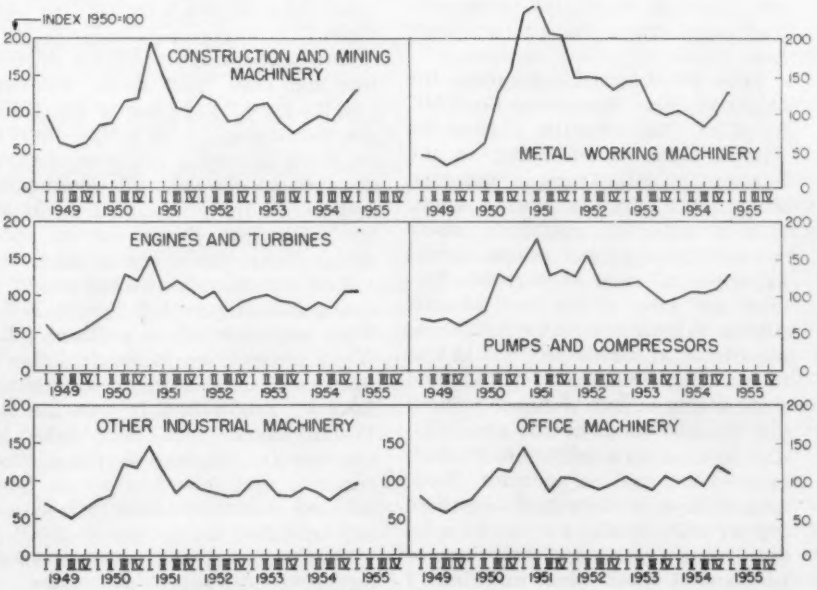
- **Engines and turbines:** April new orders were the highest for that month in seven years—25% above those for April 1954.
- **Pumps and compressors:** This was the second highest April in Index history. And in only three months during the last seven years have new orders run higher than in April —April 1951, May 1951, and June 1952. Current index is 48% above last year.
- **Construction and mining machinery:** Here, too, April was the second highest April since 1949. April 1955 index was 21% above the index for April 1954.
- **Metalworking machinery:** New orders dropped off sharply in April, with the index (unadjusted for seasonal changes) 32% below the preceding month and 7% below April 1954.
- **Other industrial machinery:** new orders dropped off in April. But the index was still 14% higher than April 1954, and this was the first time the index stayed over 100 for two months since '52.
- **Office equipment:** New orders were 2% lower in April than a year ago. This is the only machinery group where fourth quarter 1954 new business topped that of first quarter 1955.

The machinery new orders index is based on confidential reports from capital goods manufacturing companies who account for nearly 50% of all machinery sales.

Here's the overall index...



...and how its six components are doing



"ALLEN'S ALLEY":

One Corner Prosperity Hasn't Been Around Lately

NEW YORK—Out on Long Island, maybe halfway between Brooklyn and Montauk, is a half-mile-long paved street set almost literally in the middle of nowhere. This is Allen Boulevard, more familiarly known as "Allen's Alley." Lining it on either side are a score or so of small, one-storied Metalworking shops, with a small foundry or two and a steel warehouse thrown in for good measure.

Allen's Alley lies just about in the middle of a triangle formed by three major aircraft plants—Grumman, Fairchild and Republic. Logically, these shops would be naturals as subcontractors for the airframe makers, but with one or two exceptions, it's not so. In fact, if the metworkers of Allen's Alley have one thing in common, it's that their products, and there are a lot of them, have little in common. Along one two-block stretch, you'll find shops producing marine parts and hardware, metal toys, radio chassis, electrical outlet boxes, screw machine products, castings, instruments, parts for mine detectors, drill jigs, and a variety of electronic components.

Alleyites are Individualists

This may be because the shop owners are rugged individualists, most of them, preferring to scout the woods for work from many different industries to relying on subcontract work from the airframe outfits.

Take Mike Juried, who owns the Mi-Al Machine Specialties Co ("Mi" for Mike, "Al" for Alice—"gives the wife a sense of belonging to the business"). Mike runs a two-man shop specializing in marine work. He's a topnotch machinist who's worked, among other places, in the experimental shop of Brewster Aircraft and some of the local aircraft plants. Mike also does mock-ups and experimental machining; would like to work into the plaster pattern and mold business, but "I haven't found any demand for it in this area." Today, most of his work comes through brokers and marine agencies. Business, he says, is "very good—but then I don't want much. I could do a lot more, but I can't get the class of mechanic I want. Next machinist I hire will have a math background through solid geometry at least, so he can visualize what a cutting tool does. Give me a dozen men like than and I'll turn out more and better work, with fewer rejects, on general-purpose machines than the big boys can produce on fancy machines."

You hear this echoed all up and down Allen's Alley: "You can't get topnotch machinists these days. Who wants to go through a five-year apprenticeship when you make as much digging ditches? We're training a few men around here, but we don't call them apprentices—you can't call a married man an apprentice—he'll quit. It used to be pride of craft, now it's pride of pocketbook."

Of Mice and Women

Andrew Pileri, an old-time master tool and diemaker who runs a job shop across the street, tells the story about a girl who came in the other day for a job. "Way she talked, you'd think she'd starve if I didn't give her a job. I gave her one. She worked one day and next morning didn't show up. Later, the US Employment Service man stopped by to look for mice. Seems this girl told him a mouse ran across the table where she was working, and she couldn't possibly work under those conditions. None of our regular girls ever saw a mouse around here. Besides, what would a mouse live on? Chips?"

How's business in Allen's Alley? One man says "very good," another "pretty good," but "fair to lousy" is the consensus. It isn't that there's no work around—"you can always go over to the aircraft companies and they'll try you out on a job or two"—it's that things are so cutthroat today, there's no profit in it.

Said one Alleyite, "What would I consider a fair profit? About 15%. What are most of us getting? 5%. While competition is tough, I don't think any shop intentionally aims for a 5% profit—20% is more like it. Trouble is, the small shop today is so desperate, it'll take anything. The result is that they foul up on jobs that are over their heads. Misquotes and mistakes eat up the profits."

That's the reason another shop owner "wouldn't touch a government contract with a ten-foot pole. Between red tape and renegotiation, you can lose your shirt. One big shop near here is on the verge of bankruptcy. They haven't had a job in a year — ever since their biggest work source pulled back the work into his own shop, when his defense business slowed down."

We asked, "Have any of you asked the Small Business Administration for help?"

Most of the answers were unprintable, but one owner had this to say: "You go down to Washington. You waste a day trying to find the right man. You sit down across the desk from a guy who thinks he's an executive, but he's only qualified as a clerk. He throws some drawings in front of you and gives you a fancy speech on the importance of accurate bidding. Most of the work is tricky stuff nobody wants to handle. You take a couple of jobs home anyway and submit bids. If you get the job, you'll find something like this: the material is special and only obtainable from the original source —at his price and delivery. They give you a list of rules 'for your protection' in bidding. All I can say is if you follow every one and don't make a mistake in bidding, you'll never get the job."

Be that as it may, most Allen's Alleyites would rather look around for commercial jobs; have regular customers who keep them going. Even so, business isn't what it should be, and the Alleyites are vocal about it. One says, "Things are shot to hell if you ask me. I'd sell out right now —lock, stock and barrel and an acre of ground for $60,000—know any takers?"

1955: Small Shop Fizzle?

Others aren't quite this pessimistic, but they think 1955 so far is pretty much of a fizzle for the small shop. The few who specialize in aircraft jobs hope things will look up when Republic gets its field cleared of F-84's and tooling starts on F-105's and other new military contracts. The general job shops, however, don't see much improvement in the immediate future: are hoping long-range growth of Long Island industry will make it worthwhile for them to sweat out current doldrums.

Companies in the News . . .

Assembly Products Inc, Chesterland, Ohio, has purchased a 40-acre site near Desert Hot Springs, Calif, plans to build a meter-relay and control plant there.

Garrett Corp, Los Angeles, makers of aircraft accessories and components, has formed an **AiResearch Industrial Division** to manufacture turbochargers for diesel engines, and other turbo and related machinery for industrial use.

Chrysler Corp has formed a new **Supply Division** to produce major components, such as PowerFlite transmissions, shock absorbers, forged and machined parts, and standard transmissions for Chrysler cars. The division consists of Chrysler plants at Indianapolis, New Castle, Ind, and Kokomo, Ind.

Colonial Broach Co, Detroit, has licensed **Maskin A/B Thule** of Malmo Sweden, to manufacture Colonial broaches for Europe.

Union Twist Drill Co's Butterfield Division is celebrating its 75th year. Started as a maker of hand-made wagon-wheel-axle cutters in 1880, the company today employs 750 people in its tap, die and drill manufacturing operations in Canada and the U S.

Barth Corp, Cleveland manufacturers of special machinery and automation equipment, plans the third and largest round of expansion at its built-in-1951 Brookpark Rd plant, with addition of a 20,000-sq-ft wing to house manufacturing and office space.

Ebco Mfg Co, Columbus, Ohio, manufacturer of water coolers, recently held an open house at its 240,000-sq-ft "dream factory" (glareproof lighting, air conditioning, even a built-in aquarium in the lobby).

Teer, Wickwire & Co, Jackson, Mich, has purchased the **Lindberg Air and Hydraulic Cylinder Division** from **Lindberg Engineering Co,** Chicago, and in addition to stock, machinery, designs and development work will take over the Division's entire field sales setup.

Perfection Industries, Cleveland, has purchased **Knox Metal Products Co,** Waynesboro, Ga.

Mount Hope Machinery Co has opened a repair and service branch plant at 208 W Griffith St, Charlotte, N C, offering complete factory overhaul on its textile, paper and plastic machinery.

O Ames Co, Parkersburg, W Va, shovel manufacturer, has been merged into the **McDonough Co** of Houston, Texas. Bernard P McDonough succeeds Harold Cunningham as head of the firm, which will become a McDonough division.

Sherwin-Williams Co, paint manufacturer, has a $1.5-million can-manufacturing plant under construction in San Leandro, Calif. S-W will make paint cans for other manufacturers there, too.

Connor Spring Mfg Co, San Francisco, has opened a 5000-sq-ft mechanical spring, wire form and stampings plant at Dallas.

Weston Electrical Instrument Corp, by recent stockholder approval, has been merged into **Daystrom Inc,** Philadelphia.

Birdsboro Steel Foundry & Machine Co, Birdsboro, Pa, has acquired **Engineering Supervision Co** of that city. ESCo will become a division and will be headed by its former president, Alexander Zeitlin.

Howe & Fant Inc, makers of the H & F turret drill and drilling attachments, has moved into a new one-story plant at 20 Fitch St, East Norwalk, Conn.

Oster Mfg Co, Cleveland, plans to centralize its pipe and bolt threading machine manufacturing operations this year by moving its main plant and offices to Wickliffe, Ohio. Occupancy of the 105,000-sq-ft building is slated for this September. Oster already operates a 36,000-sq-ft plant at Wickliffe.

W C Twigg Industries Inc, Brazil, Ind, makers of jet-engine components and precision assemblies, is adding 23,000-sq-ft to its plant.

Beloit Tool Corp's Regal Division has acquired a plant in Beloit, Wis, for the manufacture of high-speed ground thread taps, to be distributed through cutting tool specialists.

Arvin Industries Inc, Columbus, Ind, will convert its radio and television plant to automotive parts production. Radio and electronic operations will be shifted to another Columbus plant that has been inactive since WWII. Arvin's plant will be converted to auto parts output by September 1.

Clary Corp, San Gabriel, Calif, has acquired **Avron Corp,** Long Beach Calif, makers of aircraft valves, will transfer all Avron output to its San Gabriel plant.

Chrysler Corp has integrated press operations of its Nine Mile Press Plant, Detroit, with the company's Automotive Body Division. The stamping facility, formerly operated by the Dodge Division, has been realigned to speed up coordination between body-part fabrication and assembly and Plymouth body production. Automotive Body Division general manager John E Brennan will be responsible for overall operation. Roy Blasiola is plant manager.

American Motors says it will increase output of Ramblers as much as 60% this summer. Expansion at the Kenosha assembly plant will raise daily production there to 800 from the present 500. Total output will be upped from 1200 to 1700 Ramblers daily.

Burroughs Corp, Detroit, is starting construction of a 28,500-sq-ft electronics research and development building at Paoli, Pa.

Atlas Power Co, Wilmington, Del, has purchased **Parke Tompson Associates,** Kirkwood, Mo, bomb and rocket fuse designing and manufacturing firm.

Utility Appliance Corp is constructing a 105,000-sq-ft addition to its Alameda St plant in Los Angeles. The building will contain a completely automatic metal cleaning and paint-finishing system.

Claud S Gordon Co, Chicago, expects to double its thermo-couple wire and pyrometer output with an addition to its Richmond, Ill, plant.

CINCINNATI MILLING & GRINDING MACHINES ELECTS .. Alfred T Blackburn, works manager, and **E D Vancil,** manager of Process Machinery Division, The Cincinnati Milling Machine Co, named vice presidents and directors of the company's sales organization, Cincinnati Milling & Grinding Machines, Inc. Both men have been associated with the parent company for many years.

Douglas H Thomson, vice president and secretary of The E Horton & Son Co of Windsor Locks, Conn, has been named president, succeeding **Robert S Cooper,** who recently resigned

Names in the News . . .

Tinius Olsen Testing Machine Co, Willow Grove, Pa, names: **Tinius Olsen II,** president, to succeed his father, **Thorsten Y Olsen,** elevated to chairman of the board; **C Robert Tait,** a vice president; and **Walter P Haun,** former secretary, to secretary-treasurer. Mr Tait will continue to serve as works manager.

William A Yost, Jr, vice president of Allis-Chalmers Manufacturing Co's General Machinery Division, has been appointed to the newly created post of vice president, staff operations, for the organization.

James J Reynolds, vice president of industrial relations of Alco Products, Inc, Schenectady, NY, has been appointed vice president, operations.

Arch A Warner has retired as president and general manager of the Mechanics Universal Joint Division of Borg-Warner Corp. **L G Porter,** administrative vice president of B-W, has been elected to serve temporarily as president of Mechanics until a successor to Mr Warner is appointed.

Joseph Friedman, first vice president and director of sales of United States Hoffman Machinery Corp, has been elected executive vice president of the New York company.

Walter F Martin, assistant purchasing agent of Morse Twist Drill & Machine Co, New Bedford, Mass, has been appointed purchasing agent to succeed **R E Zilly.**

Rockwell Manufacturing Co, Pittsburgh, elects: **Paul C Kreuch,** assistant to the vice president in charge of the company's Meter & Valve Division, to a vice president in that division; and **Eugene F Foubert,** manager of industrial relations for the company, to vice president, industrial relations.

National Screw & Manufacturing Co (Cleveland) appointments: **Price Berrien,** general plant manager, to works manager; **J Robinson Hyde,** production manager, to director of sales research; **Clayton J Cross,** assistant production manager, to succeed Mr Hyde; **Howard L Hopkins,** chief metallurgist, to chief engineer in charge of all production engineering; and **Albert J Parker,** assistant superintendent, to chief products engineer, supervising development and research on tools and new equipment.

POTTER & JOHNSTON CO ELECTIONS .. Edward P Gillane (left), vice president and general manager, to president, general manager, and board member; and **Wilfred J Pender,** factory manager, named, in addition, vice president

S L Crawshaw, nationally known gearing industry executive, has been appointed to the post of assistant to the president of the Philadelphia Gear Works

LINCOLN ENGINEERING CO PROMOTES .. Carl H Mueller (left), director of engineering, to vice president in charge of engineering; and **John E Renner**, general sales manager, to vice president in charge of sales

Alexander Zeitlin has been elected vice president of the Birdsboro Steel Foundry & Machine Co of Birdsboro, Pa, and Pittsburgh. Mr Zeitlin will continue as president of Engineering Supervision Co of New York, recently acquired by Birdsboro

David M Gaskill, formerly sales supervisor at Brush Electronics Co, has been named sales manager of Cleveland Instrument Co. **Robert F Baskin,** former production engineering supervisor at Brush, has been appointed manufacturing manager in charge of engineering and production at Cleveland Instrument.

George G Raymond, Jr, executive vice president and sales manager of The Raymond Corp, Greene, NY, has been elected president; he succeeds his father, **George G Raymond, Sr,** named chairman of the board.

Charles G Beavers, Jr, formerly president of Brubaker Tool Corp, Millersburg, Pa, has been elected president of Follansbee Metals, Inc, Wallingford, Conn. He succeeds **Frederick W Richmond,** named chairman of the board.

Henry R Merrill, a director, and assistant general sales manager of the Behr-Manning Division of Norton Co, has been appointed general sales manager of the division

G E Jones, assistant manager of Plomb Tool Co's Proto Tools Division, Jamestown, NY, has been named divisional vice president and manager.

Harold M Schudt, vice president of Canadian Allis-Chalmers Limited, Montreal, has been elected president. He replaces **Mark C Lowe,** who has resigned.

Ajax Flexible Coupling Co, Westfield, NY, elections: **Wayne Belden,** executive vice president, to president; **Charles W Belden,** vice president; **Harley E Northrop,** treasurer; **Robert G Cady,** secretary.

Great Lakes Stamping & Manufacturing Co (Toledo) elections: **George Pinkus,** executive vice president, purchasing agent, and assistant to to the president, named president, to succeed **V E Snyder,** who will continue to serve in an advisory and consulting capacity; **B J Secor,** vice president; **A R Pass,** vice president; **Henry Bloch,** secretary; **Howard Pinkus,** treasurer; and **Benjamin Z Ranan,** general manager in charge of manufacturing.

E B Cottingham, vice president in charge of production for Henry Pratt Co, valve manufacturers of Chicago and Dixon, Ill, has been elected president; he succeeds **S B Smith,** named chairman of the board.

Chain Belt Co's Shafer Bearing Division (Downers Grove, Ill) appointments: **Horace A Tennes,** sales manager, to division manager, succeeding **Ray P Tennes,** who has retired; **John N Tufts,** assistant sales manager, to sales manager.

William A Martin, vice president and general manager of Chrysler Corp's Marine & Industrial Engine Division, has been elected president to succeed **R T Keller,** who recently took charge of the company's West Coast automotive plant operations. Mr Martin has also been appointed general manager of the company's Trenton, Mich, plant.

Eugene L Mackey, chief engineer in charge of estimating, has been named director of engineering of the Yoder Co, Cleveland, Ohio, producer of cold roll forming machinery and slitting equipment.

Obituaries

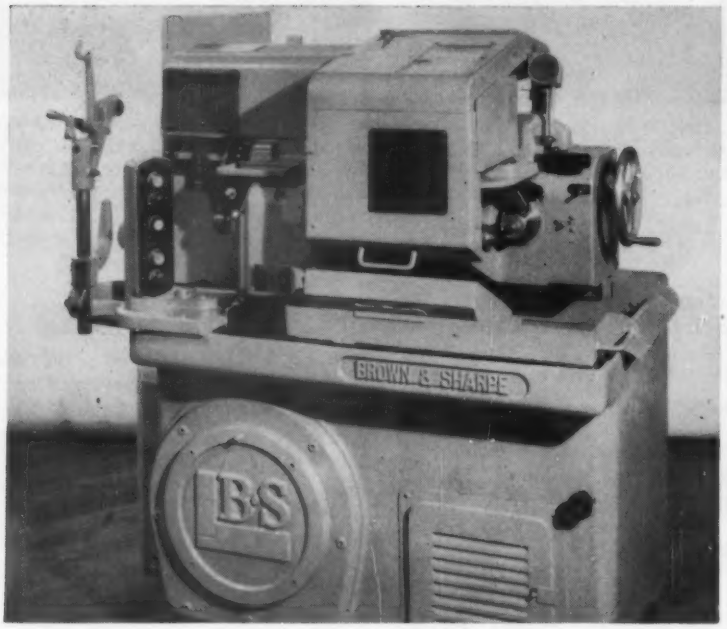
Edward D Frank, 69, for many years a director and vice president of National Automatic Tool Co, died suddenly in Chicago on May 5.

John P Breuer, 68, hob engineer, and nationally known authority on gear production, died April 20. Mr Breuer, active for many years in the American Gear Manufacturers' Association, and the Metal Cutting Tool Institute, was associated with Barber-Colman Co, Rockford, Ill, for 44 years.

F J Peters, vice president of National Automatic Tool Co, Richmond, Ind, died recently during an executive conference at Natco.

Henry E Goeppel, who had served as vice president and director of the Detroit Power Screwdriver Co, Detroit, for 29 years, died May 9.

New Shop Equipment,



Brown & Sharpe Automatic Screw Machine Provides Fast Setup, Increased Production

The new No. OO automatic screw machine is reported to be the fastest automatic in its range (see cover). Taking stock up to ½ in., with 1-in. turning length (and to 1½ in. with special setup), it has a maximum spindle speed of 7200 rpm. The rigid construction allows use of carbide tooling on many jobs.

Pushbutton control shortens setup time. Cross slides; detachable ways of hardened ground steel; precision ball bearings in spindle and sprockets; and automatic lubrication—these are some of the features which reduce maintenance problems to a minimum. Vertical slide is standard equipment.

Spindle speed ranges from 7200 to 34 rpm with 208 combinations in ratios from 2.3:1 to 16:1. Selection of speeds and direction are made by simple pickoff gears. Positive chain drive of spindle at all speeds assures adequate power throughout full speed range working materials from plastics to the tough alloy steels.

Both spindle and driveshaft are controlled by pushbutton from the conveniently located control post. A driveshaft jog button is useful during setup. The speed of the driveshaft (either 240 or 120 rpm)—which drives all automatic mechanisms—is changed by transposing two pickoff gears. A safety device prevents rotation in the wrong direction. Eleven change gears give the complete range of 120 production rates from ¾ to 100 seconds per piece.

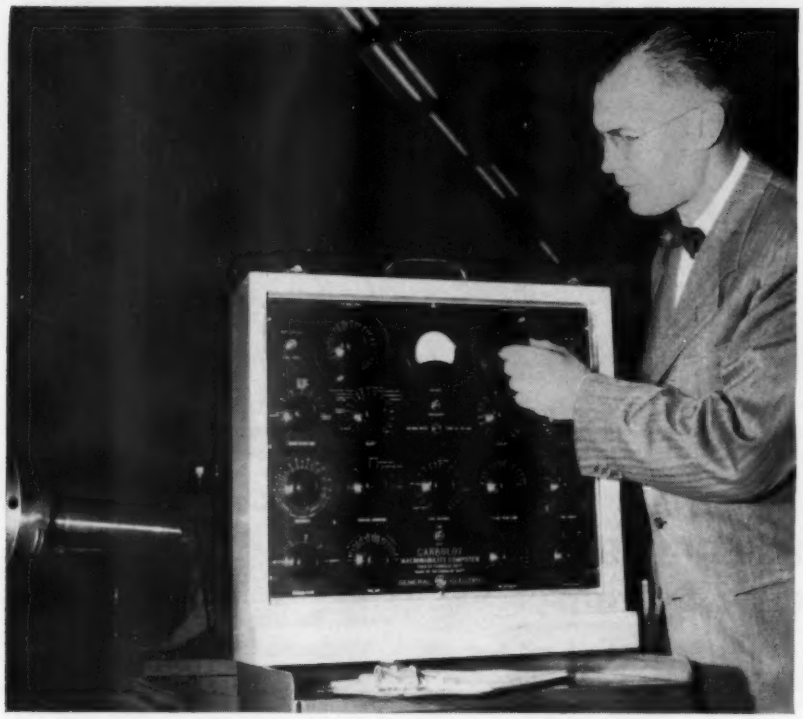
CONVENIENCE AND SAFETY

The B&S automatic has been designed with full attention to conveniences and safety features. The driveshaft handwheel does not rotate when the machine is in operation and moves out of the way with the compartment door when gears are changed. The automatically lubricated turret slide has a hand lever for convenience during setup. The coolant supply is constant at both driveshaft speeds. The working area is well guarded with windows. The large capacity chip tray is readily removed and a wide trough facilitates raking out chips while the machine is running. The electrical installations all conform to standards of the Joint Industry Conference.

In addition to the many attachments available for previous B&S automatics, two new ones have been added to the model No. OO. The skip indexing attachment gives greatly increased production on deep drilling operations. The brake-in-neutral attachment will permit use of both high and low speeds on jobs where provision must be made to automatically stop the spindle.

Brown & Sharpe Mfg Co, Providence 1, RI

Materials and Parts . . .



New GE Analog Computer Solves Machining Problems

A new machinability computer announced by Carboloy Dept of General Electric will solve problems in two minutes which might normally take the tool engineer several hours to compute. Use of this analog unit enables determination of whether or not correct conditions are being used for machining a current job, to set up proper conditions for a new job, or indicate relative advantages of changing some conditions to obtain greater production.

The unit considers 14 operational variables—any one may be determined by feeding in the values of the other thirteen. These variables are: cutting speed, micro-structure, alloy, feed (ipt), depth, hardness, surface condition, tool material, flank wear land, tool profile, cutting fluid, tool life, no. of teeth, and type of tool. It will also consider five variables which affect the motor horsepower required to do a machining job, obtaining an answer after being fed information on four of the variables.

The only power supply required by the unit is a self-contained radio battery. The computer is designed on a Wheatstone bridge principle and —as normally used—the null meter would be balanced to obtain proper reading of cutting speed and cu in. per minute (switch below meter allows tying it in with one or other of these variables) after setting the other thirteen values on the board.

Based on the latest machinability data, the unit was developed by Dr. W W Gilbert (above) of GE's Manufacturing Services Div. It will sell for about $500. Each will be registered and periodically updated.

Carboloy, General Electric, Detroit 32

. . . including

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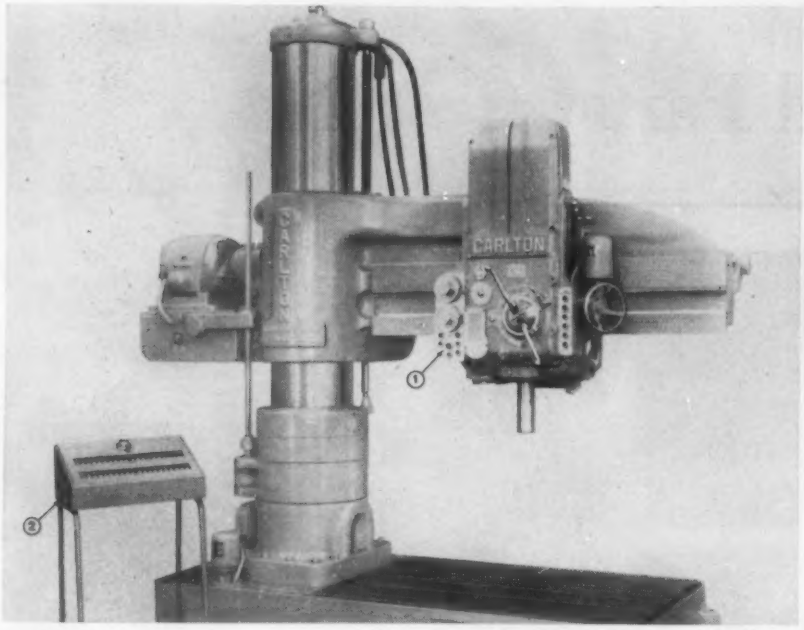
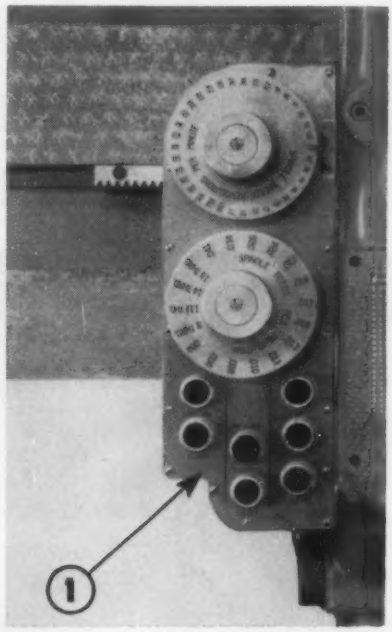


RADIAL DRILL, Carlton No. 4A, with Carlton-Leber speed-feed preselector (1) and programming system (2) installed. Either or both the new devices are now available as extra equipment, are said to offer faster and more economical hole-drilling

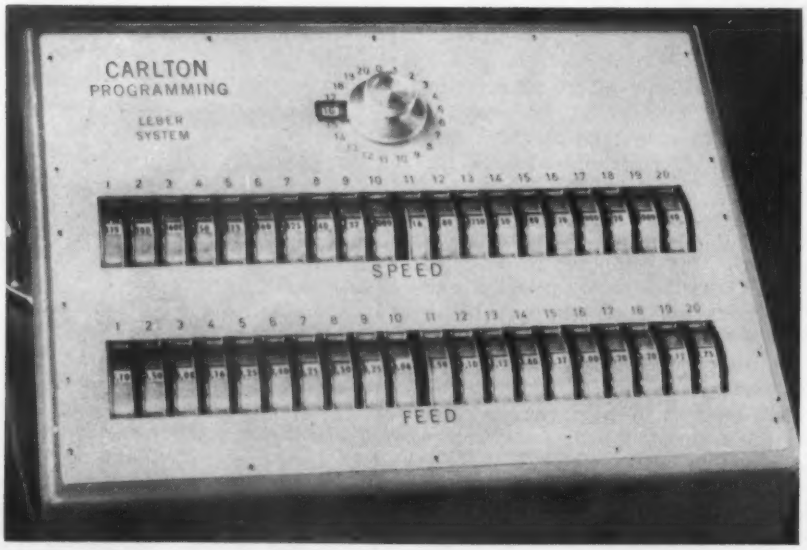


PRESELECTOR (1) allows operator to select speed and feed for the next operation while spindle is still drilling

Preselection and Programming Offered by Carlton-Leber System

The Carlton Machine Tool Co has announced the introduction of the Carlton-Leber speed-feed preselector and program systems. The two new devices offer faster and more economical hole-drilling production.

The preselector allows the operator to select the speed and feed for the next operation while the spindle is under cut. Additional time is saved by the instantaneous gear-shifting made possible by mechanically oscillating the change gears, thereby assuring quiet gear mesh.



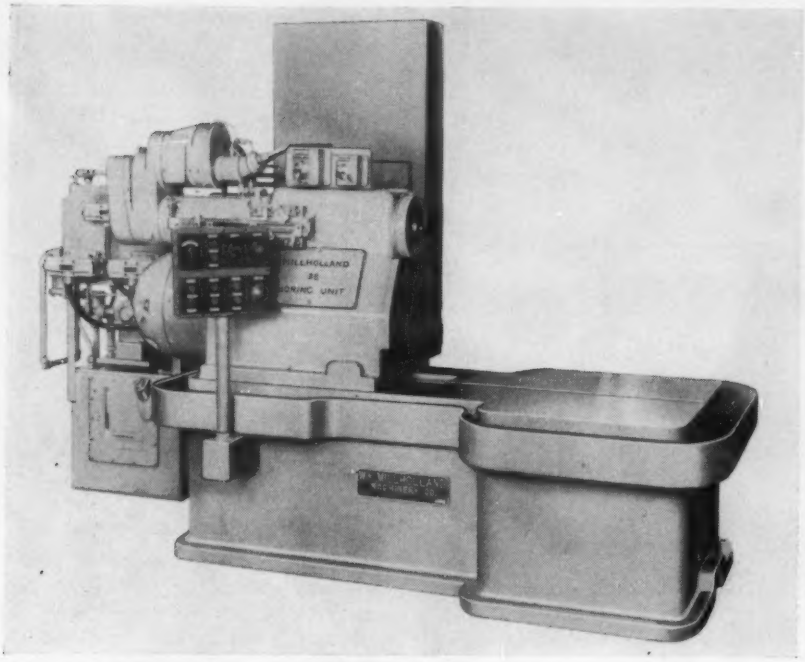
PROGRAMMING SYSTEM (2), made in 20- or 30- station sizes, includes an indexing dial to visually show the operation sequence number being performed. By manually advancing or reversing the indexing dial, operations can be performed out of sequence. Each of the 36 speeds and 18 feeds can be selected at each station

Programming permits advance preselecting of speed and feed for each operation. The programming unit includes an indexing dial to show the operation sequence number being performed. By manually advancing or reversing the indexing dial, operations can be performed out of sequence. Connection between programming console and machine is an electric cable.

Programming will permit advance planning by the production department where the workpiece drawing can be studied and sequence of drilling operations then laid out. Once the correct speed and feed data for each operation has been determined and established on working sheet or drawing, production control department can easily set up the values on the programming console which can be furnished for either 20 or 30 operations. Setting speeds and feeds is as simple as tuning a radio.

The new Carlton-Leber devices are offered as extra equipment. Carlton radial drills can now be purchased: with manual gear shift; with preselect gear shift only; or with both preselector and the programming gear shift.

The Carlton Machine Tool Co, 2831 Vernon Place, Cincinnati 19, Ohio



Horizontal Boring Mill Handles Short-Run Jobs

Standard fixed-center automatic boring machine, Model 3B, is particularly suitable for short-run production. The feed cycle is completely automatic, including rapid advance, coarse and fine feed, dwell, and rapid return. Both coarse and fine feeds are infinitely adjustable within their ranges.

The boring unit body is a box-ribbed semi-steel casting. The hardened steel alloy spindle reciprocates through hardened steel bushings mounted in the sleeve, which is contained in two precision Timken bearings. A rear-mounted third bearing is permitted to float. Spindle reduction drive is full ball-bearing mounted with ample gear tooth design—final drive is through helical gears.

Changes of feed during the automatic cycle are controlled by adjustable dogs contacting limit switches. A pressure system operating in a reservoir in the main casting lubricates spindle reduction drive and bearings. Other points are lubricated through Alemite fittings.

The feed mechanism is operated by means of a hydraulic pump and fluid motor which drives through a gear reduction to the leadscrew which in turn feeds the lead nut mounted in ball bearings on the end of the spindle. Cycle adjustments are controlled by system of valves and piping.

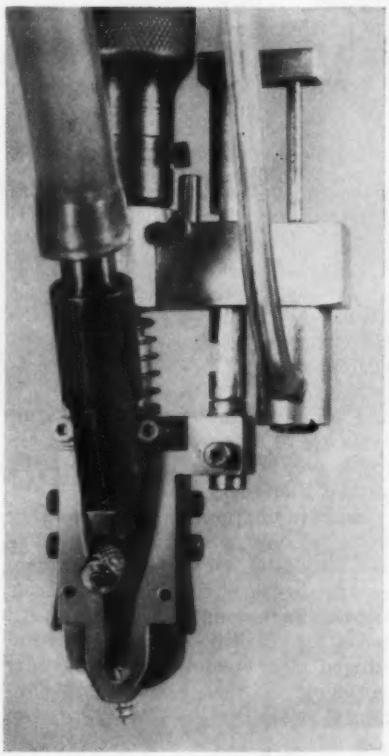
Specifications include: 5 to 10 hp; spindle speed, 33 to 500 rpm; 3-in. spindle with No. 5 MT; and 10-in. length of stroke.

W K Millholland Machinery Co, Inc, 6402 Westfield Blvd, Indianapolis 20

Cutter and Tool Grinder Has Motorized Head

Covel No. 12A universal cutter and tool grinder is equipped with Pope tilting head with direct 1-hp motor-driven spindle. Cup wheels can be used for grinding practically all clearance angles. Most cutters and reamers can be ground with single setup. Angles are read from scale located on head.

Covel Manufacturing Co, Dept P1, Benton Harbor, Mich

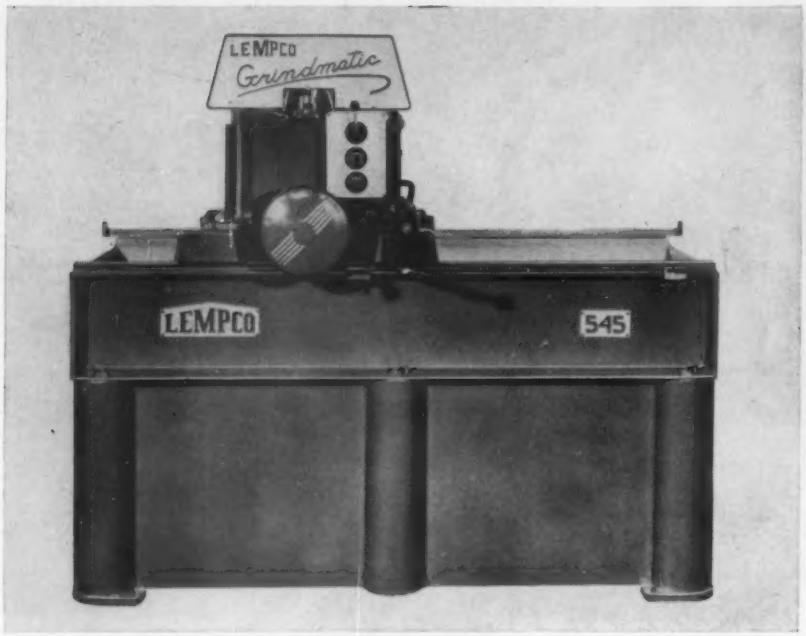


New Screw-Feeding Device Is Completely Automatic

Pneuma-Serve performs the operation of automatically locating and driving 17 screws in an irregularly shaped pattern, requiring about one second per screw. The SelecTemp operation involves fastening a gasket and stamped aluminum cover to an aluminum die-cast turbine housing. In operation, the Pneuma-Serve delivers the screws from a hopper through a plastic hose to a special head mounted on a power screwdriver.

The head grips screws in such a way that they may be mounted at any angle, in any plane. The operator may take the driver and head assembly to work stations as far as 20 feet from the hopper. If the driver is set up to operate automatically, completely automated screw fastening may be achieved. Machine will accommodate virtually any head style and sizes up to ¼ in. in dia and to 1¼ in. in length.

Pneuma-Serve Inc, 19930 Detroit Rd, Rocky River, Cleveland, Ohio



Lempco Surface Grinder Designed For Convenience

Wet automatic surface grinder, Model 545, is designed with conveniently grouped controls located at easily accessible sight and hand levels. Work can be secured with conventional holding fixtures or optional magnetic chuck. A pneumatic counterbalance in the feed mechanism of the grinding wheel helps eliminate backlash.

On the standard model a 3-hp motor drives the wheel spindle and 12-in. grinding wheel at a speed of 1140 rpm. The traverse speed rate is fixed at a constant 45 ipm with length of traverse controlled by adjustable reversing stops. Ways are flame-hardened and ground. Coolant flow is provided by pump and 50-gal. reservoir with sloping sump.

Work capacity: 38 in. long, 11½ in. wide, with maximum height of 11 in. Bed dimensions: 20 in. wide by 71 in. long.

Lempco Industrial, Inc, Bedford, Ohio

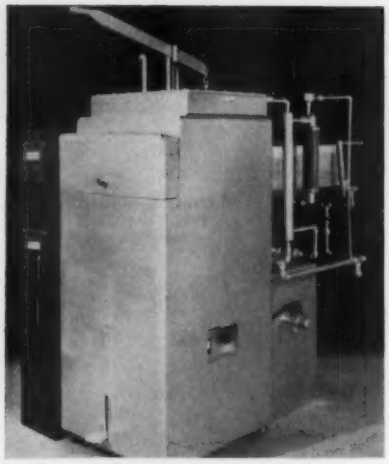
Versatile Hydraulic Truck

New Morlift model is designed for handling any items entering, within, or leaving a given plant area. Weight of 2000 lbs permits travel with full load and rider in most elevators without exceeding safety specifications.

Travel speed of the 2000-lb capacity unit is 1 to 3 mph with 2 speeds forward and 2 reverse. Short turning radius on a 180° axis permits operation in a 6-ft aisle, and easy maneuverability inside trucks, trailers, and confined areas. Operational controls are at driver's left hand, steering wheel at right. Driver steps on, rather than off the brake.

Built-in charger services two 12-v batteries and plugs into any convenient outlet. Supervision is unnecessary because automatic controls determine amount of current. All parts are readily accessible behind hinged door panels for immediate servicing.

John Morrell Manufacturing Co, Elgin, Ill



Waltz Small Tool Furnace Modified for Brazing

This electric high-temperature furnace was specially modified to incorporate a controlled-atmosphere cooling chamber. The chamber is water-cooled and completely integrated with the furnace. Capable of producing temperatures to 2400 F, furnace is reported well-suited for brazing operations and heat-treatment of all HSS, including cobalt types. It is basically a small tool furnace, having a working space 8 in. wide, 6 in. high, and 14 in. long.

Furnace is mounted on wheels, and foot lever controls the oven door.

Waltz Furnace Co, Dept 1, Symmes St, Cincinnati, Ohio

Larger Tapmatic Unit

The Tapmatic 500 with capacitv from ‡6 to ¼ in. was designed to meet demand by users of Tapmatic 300 for larger capacity attachment and operates on same weightless tapping principle.

In addition to not requiring a lead pressure by machine operator, another feature of the attachment is its positive torque-adjustment clutch which stops tap instantly when tap becomes dull, loaded, hits a hard spot, or bottoms in blind hole tapping. This spring-loaded ball clutch reduces tap breakage. A mechanism permits instantaneous reversal of tap at any time. Reversing torque is adjusted simultaneously with driving torque through one adjustment of positive mechanical clutch. Attachment incorporates use of Jacobs rubber-flex tap chuck. It is manufactured with a No. 33 Jacobs taper and can be furnished with all Morse taper arbors.

Tapmatic Corp, 845 W 16th St, Costa Mesa, Calif

Concentricity

WEBSTER says:

Having a common center as circles or spheres, one within another. Opposite to eccentric.

GREENFIELD says:

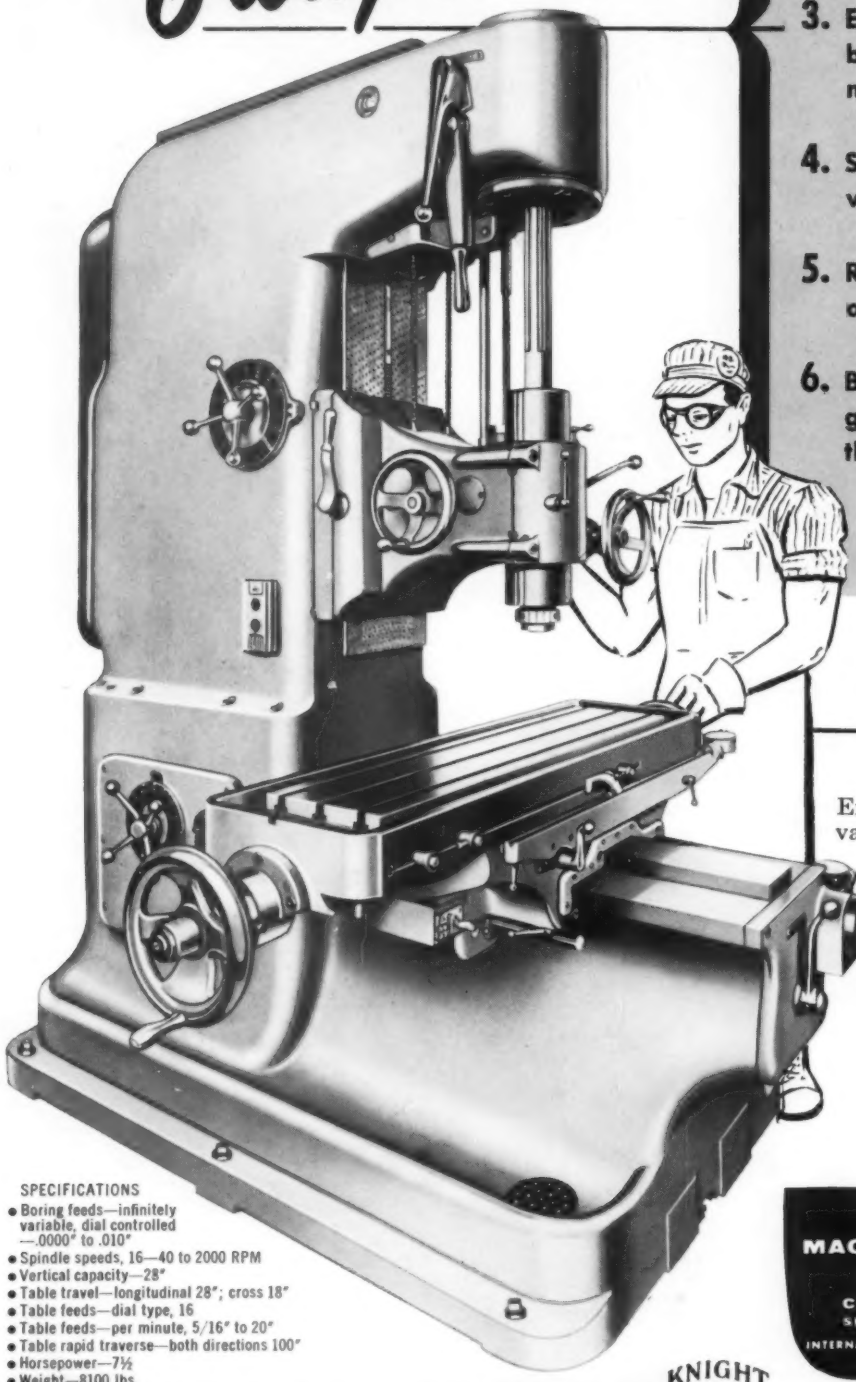
Having a common center as elements of a well made Tap, i.e. axis, outside diameter of body, pitch diameter, root diameter, core diameter, chamfer, shank diameter, square. Produced by specially designed machines.

For a complete discussion of this point, and dozens of others which affect threading results, write for "Facts About Taps and Tapping" — the new and completely revised tapping *handbook* by GREENFIELD.

GREENFIELD
TAP and DIE CORPORATION
Greenfield, Massachusetts

How 1 Machine Can Save Time & Money 6 Ways!

1. **A precision jig borer with extra talent!**
2. **Also handles an extreme range of difficult milling operations**
3. **Eliminates work transfers between jig borers and milling machines**
4. **Saves much of the layout work and preliminary drilling**
5. **Reduces job time up to 50% or more**
6. **Bed-type table guarantees greater rigidity and accuracy than knee-type**



KNIGHT'S No. 50

Exclusive dial-controlled infinitely variable spindle feeds—Extra-long travel of the 1-piece roller bearing-mounted spindle increases capacity—Quick-action controls all operated from 1 position—Rugged, rigid construction for accuracy—Power to spare—Many other time-&-money-saving features!

SPECIFICATIONS
- Boring feeds—infinitely variable, dial controlled —.0000" to .010"
- Spindle speeds, 16—40 to 2000 RPM
- Vertical capacity—28"
- Table travel—longitudinal 28"; cross 18"
- Table feeds—dial type, 16
- Table feeds—per minute, 5/16" to 20"
- Table rapid traverse—both directions 100"
- Horsepower—7½
- Weight—8100 lbs.

Write for Catalog

THE MACHINE TOOL SHOW
CHICAGO, ILL.
SEPT. 6-17, 1955
INTERNATIONAL AMPHITHEATRE

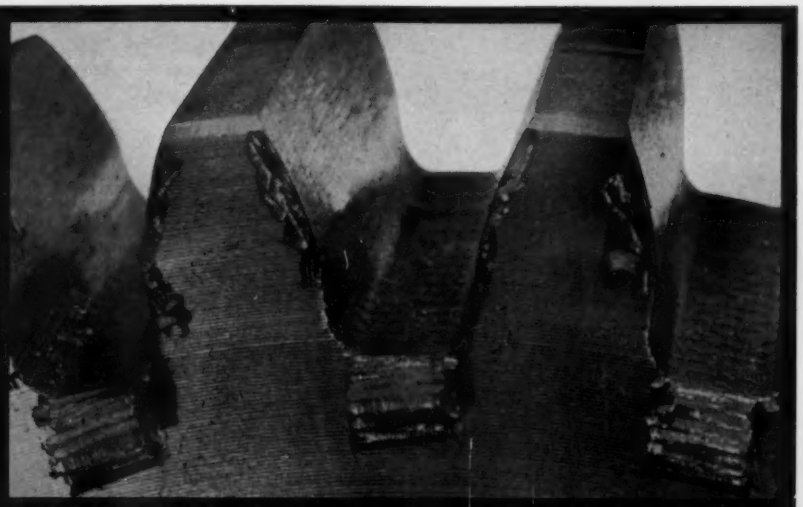
MT

KNIGHT VERSATILE MILLERS ACCURATE RIGID

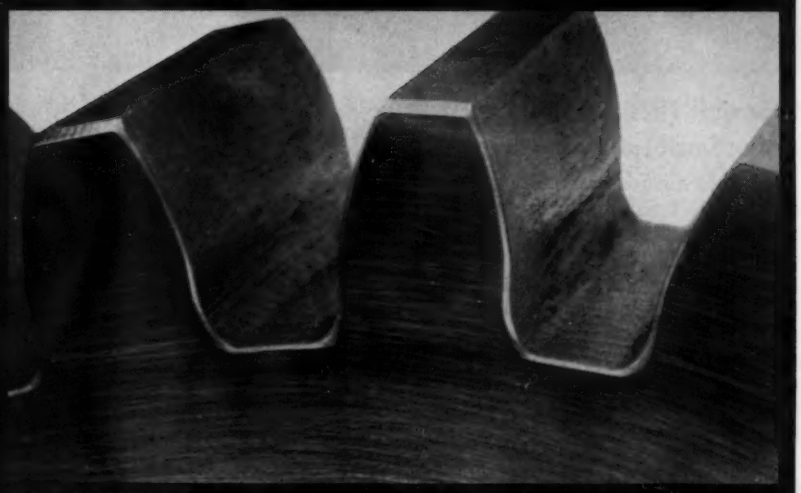
W. B. KNIGHT MACHINERY CO.
3920 W. Pine Blvd. St. Louis 8, Mo.

Osborn Brushamatic

. . . rough to finish in one operation



BEFORE BRUSHING. Edges have heavy burrs. Sharp corners permit high stress concentrations . . . possible sources for failure.



AFTER BRUSHING. Burrs are gone . . . smooth, uniform blend on junctures of gear face and involute increase tooth strength.

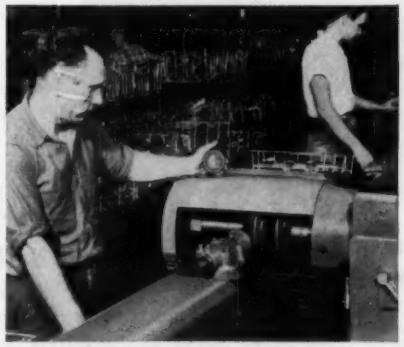
At the push of a button, you can now blend surface junctures on gear teeth . . . at the same time burrs are removed. Each gear tooth is uniform in quality. Production is less costly because it's simpler, faster.

Gears finished on Osborn Brushamatics are stronger, more dependable. By removing sharp corners, stress concentrations are avoided. Thus, there is less chance for failure in severe service.

Your operator simply loads and unloads the work. Brushamatic rotates the piece against revolving brushes on preset time cycles.

An **O**sborn **B**rushing **A**nalyst can show you how to put Brushamatic to work for you. One machine can handle a large variety of work . . . is easy to set up from job to job. Call or write *The Osborn Manufacturing Company, Dept. C-33, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

*Trade-Mark

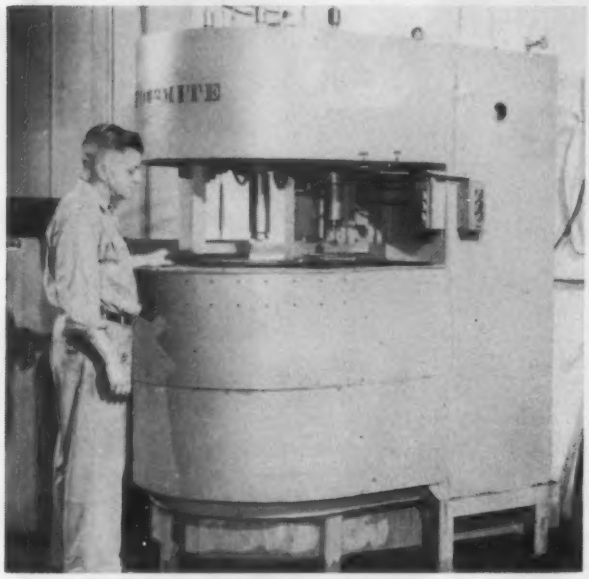


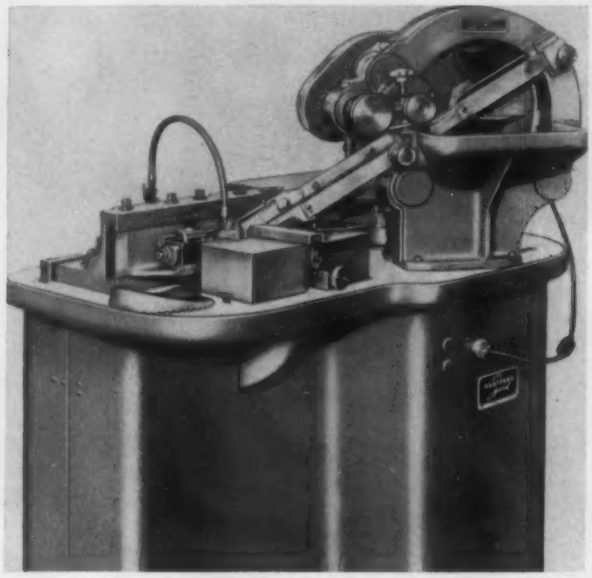
OSBORN BRUSHAMATIC*. ***Saves over 1000 manhours every year. Capable of handling over 2000 parts a day.***

Osborn Brushes

OSBORN

BRUSHING METHODS • POWER, PAINT AND MAINTENANCE BRUSHES
BRUSHING MACHINES • FOUNDRY MOLDING MACHINES





Mechanical Finishing Machine Handles Small-Lot Production

The Roto-mite is a semi-automatic mechanical finishing machine designed to handle a wide variety of parts in a relatively short time cycle. It is built with removable tub in which finishing mass is contained and rotated. Change-over is a quick operation; each tub has built-in sludge removal system. The tub is 44 in. in dia with working depth of 13 in.

Main drive is a 5-hp U S Varidrive vertically mounted in rear of machine. Power unit is belt-connected to tub drive assembly. Remote speed control allows selection of processing speeds from 100 to 500 fpm.

In operation, parts are held in fixtures attached to lower ends of vertically mounted spindles above the mass. Spindles lower to submerge parts. The Roto-mite has four spindles and is available with three different spindle arrangements. Spindles are complete with manual flushing, and manual-controlled air-operated fixture locking and unlocking. Rotation of spindles stops automatically when spindles are raised from mass.

Roto-Finish Co, Kalamazoo, Mich

Thread-Rolling Machine Adds New Feeding System

Model A-190-R special thread-rolling machine is essentially model A-190-H to which a self-contained rotary hopper has been added to boost production rate to 250 pieces per hour. The rotary hopper has a larger capacity and produces longer runs than does basic model. Feed rates have been lengthened to accommodate more pieces, providing more time for feed clearing wheel to reject imperfect blanks which clog the feed rail. In addition, a built-in vibrator assures positive feeding.

The hopper is completely self-contained—power from a 1/12-hp motor drives the hopper independently, permitting variable bucket speeds merely by changing gears. Hopper bucket is made of iron and lifts out for servicing. Clearing wheel is mounted on bracket which swings away from tracks.

The machine has screw-diameter capacity from No. 2 to No. 8. Thread-length capacity is ⅛ to 1½ in. with standard depth dies.

The Hartford Special Machinery Co, 287 Homestead Ave, Hartford 12, Conn

Hydraulic Table Assists In Changing Big Dies

This 30,000-lb capacity unit has a platform 65 in. wide by 96 in. long. Special heavy-duty rollers are set in three banks so that dies can be drawn from the long side. A 16-in. range of elevation allows table to be used with presses having bed heights from 29¼ in. to 45¼ in.

In operation, table is raised by pushbutton-controlled, electric-powered hydraulic pumping unit and six synchronized hydraulic rams. After top is adusted to proper bed height, table is bolted to press by special plates welded to the long side. Cables are fastened to the die at two ends, and a 96:1 ratio double-drum winch enables one man to pull the heaviest dies from a large press. Portable unit can be positioned by two or three men.

Raymond Corp, 47-133 Madison St, Greene, NY

Nuclear Battery

A nuclear battery that converts nuclear energy into electrical energy is capable of performing reliably from –60 F to +160 F and has an operating life in excess of 25 years. Three models have ratings from 1 to 10,000 v and 5 to 2000 mu-amps. The disintegration of Strontium 90 is used as the energy source. One of the models is a multiple voltage source with four taps.

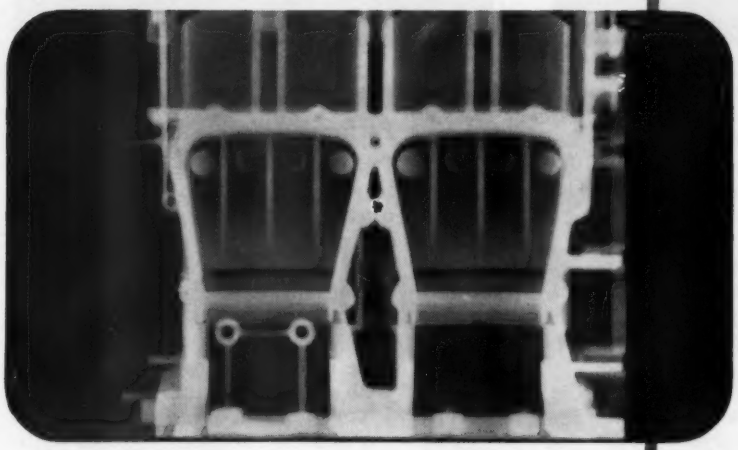
Universal Winding Co, Box 1605, Providence, RI

Keyway Broaches

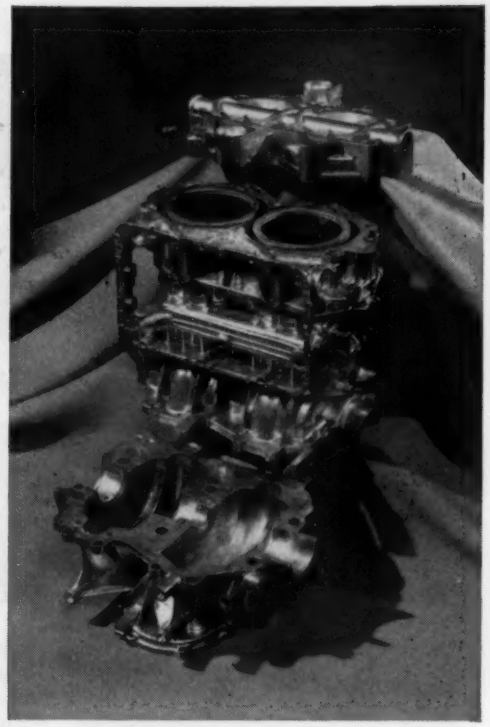
Production HSS keyway broaches are now standard items in the du Mont line. Ready for immediate delivery are keyway-width sizes ⅛, 3/16, and ¼ in. and body diameters from ½ to 1 in. by 1/16-in. increments. Broaches may be used with hydraulic or hand arbor press. Back is ground to fit radius of bore.

The du Mont Corporation, Greenfield, Mass

Dependability is a must . . . so



RADIOGRAPHY keeps its eye on production



SALES of outboard motors have gone up dramatically. New high power, smoothness, and quiet have all helped. But chief of their outstanding virtues is dependability.

This quality is guarded by radiography. It insures soundness of castings—sees that weakness is not lurking in a hidden flaw.

Radiography cuts cost, too, when x-rays reveal unsatisfactory castings before machining is begun.

Today radiography is playing a greater and greater role in good foundry operations. It frequently points the way to better casting methods . . . makes sure only sound castings are delivered.

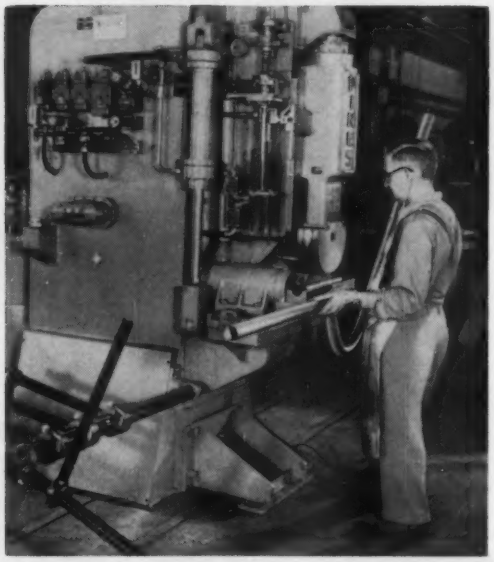
If you'd like to know how radiography can help you, get in touch with your x-ray dealer. Or, if you like, write us for a free copy of "Radiography as a Foundry Tool."

Radiography . . .

another important example of Photography at Work.

Kodak

EASTMAN KODAK COMPANY, X-ray Division, Rochester 4, N.Y.



Automatic Welding Process Shields Arc With CO_2

The C-OMATIC welding process uses low-cost carbon-dioxide gas for shielding the arc while welding mild and medium carbon steel. It is stated to offer the advantages of low-cost automatic welding plus the benefit of a visible arc. A O Smith quotes the following costs as indicative of savings through use of CO_2. Based on 260-day work year, on three-shift operation, 60% duty-cycle cost of CO_2 would be $1053 compared with $16,420 for helium. In quantity use the relative CO_2 figure can be brought lower.

The C-OMATIC welding head is a simple unit. Filler wire of special formulation is fed to head by rollers with motor drive giving selection of wire feed speeds. This permits application to submerged arc welding.

The nozzle consists primarily of contact tube, water-cooled jacket, and gas-shielded jacket. All major metal parts are brazed together. Gas shields the wire along the full length of the contact tube.

The control system is electro-mechanical in design. System is constant-current type and maintains preset arc voltage.

A O Smith Corporation, Milwaukee, Wis

Pipe and Tube Bending Press Performs 1400 Bends per Hr

Pines pipe and tube bending press is reported to have increased production to 1400 bends per hour without excessive distortion. Press is a fully hydraulic unit with adequate power for repeat bending of ½- through 2-in.-OD steel tubing with max wall thickness of 0.083 in. Clearance is provided to bend a 2-in. tube with a 5-in. centerline radius to 180°.

The new one-piece C-frame casting and the cast steel ram and built-in ram cylinder give extra strength and rigidity. Limit-switch actuation of a four-way directional valve assures accurate work. A secondary safety switch protects against override. Smooth wing die operation has been accomplished by incorporating return-stroke cushions in the wing die cylinders.

Valves are now panel-mounted on a sandwich manifold in which series of plates containing routed channels and interconnecting distributing points are brazed into one unit. Adjustment has been added to limit return stroke of ram which reduces cycle time for shallow-bend operations.

Pines Engineering Co, Inc, 601 Walnut St, Aurora, Ill

Bi-Directional, Two-Speed Gear-Driven Actuator

Model 474 drive unit, with choice of two speeds on the output shaft, is instantly reversible without requiring reversal of motor armature, and develops output torque of 44 in.-lb. Applied as a scan drive, it rotates a parabolic antenna a full 360° at 40 rpm in either direction, or makes 90 looks per minute on a 120° sector. By energizing a built-in speed selector, similar full or sector scans can be made at 15 rpm.

Two hysteresis - type magnetic clutches transmit torque independent of speed. Velocity is therefore constant throughout scan, and unit can be switched from full 360° rotation in either direction to 120° sectoring with smooth and rapid reversal.

American Eelctric Motors, 4811 Telegraph Rd, Los Angeles 22, Calif

Butterfield milling cutters (Canadian) with staggered tooth side are now available in this country. Keyways are so placed in relation to teeth that any number of cutters having same number of teeth can be interlocked by grinding hubs to required thickness. Standard stock cutters can be easily converted into special combination units that can cut extra-large slots.

Garrett Corp's Garrett Supply Div, Los Angeles, Calif

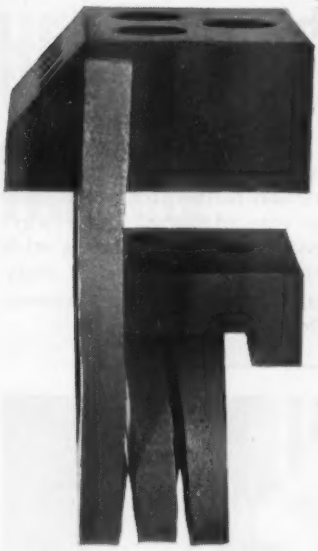
Carbide-tipped drills for cutting hardened steels have high-speed hardened steel body and shank and extra-large, solid carbide ends. Type HSC is available in 27 sizes from 3/32 to 1/2 in., with round shank; Type H, with hexagonal body, in sizes from ⅜ to ¾ in.

Super Tool Co, 21650 Hoover Rd, Detroit 13, Mich

I-T-E SAVES MONEY BY USING

Revere Extruded Shapes

PROBABLY YOU CAN TOO!



Actuating mechanism, showing overload coil brazed to two Revere Extruded Shapes.

Overload device, OD-2, made by I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia, Pa., using Revere Copper Extruded Shapes.

Here is a photograph of the I-T-E Dual Selective Overcurrent Trip, an air circuit breaker part. It contains two Revere Extruded Shapes, in copper. In the detail view, the beveled shape at the top is furnished in Free-Cutting Copper, to speed up the drilling and tapping of the holes. The piece below it was originally milled from rectangular copper bar, 1 x 2 inches. The bar weighed 7¾ lbs per foot, and 1.8 lb of scrap per foot was generated in machining it to the angular form shown. The company then switched to a Revere Extruded Shape, weighing a little less than 6 lbs per foot. Though the shape inevitably costs more per pound than the bar, the reduction in weight was sufficient to save almost 44¢ per foot over the bar, and of course additional savings were realized in reduced machining time and in scrap handling. Production also was speeded up. This is an outstanding example of the economies offered by shapes.

Look into extruded shapes, in copper and copper-base alloys, and aluminum alloys. The nearest Revere Sales Office will be glad to explore the subject with you.

REVERE

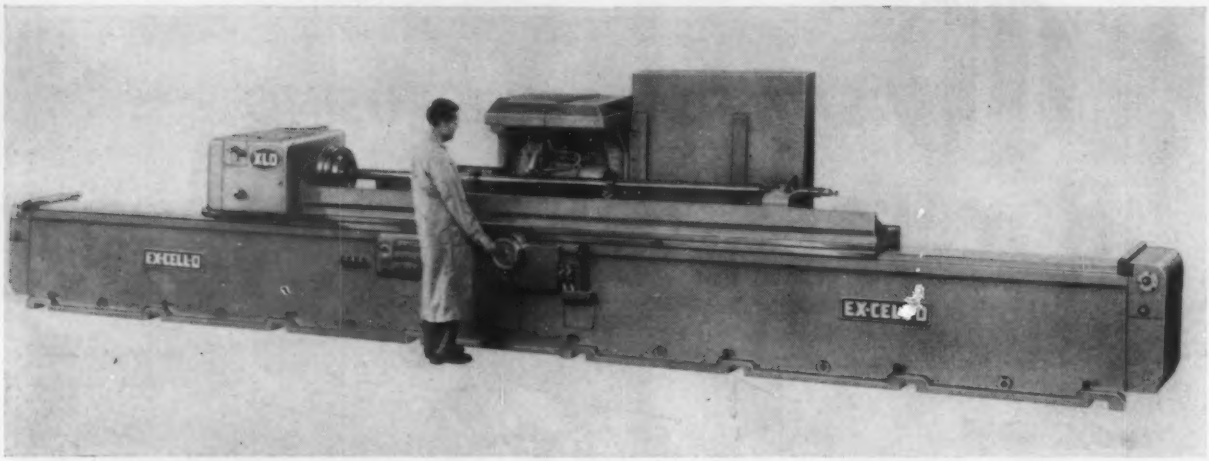
COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

• • •

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N.Y. Sales Offices in Principal Cities; Distributors Everywhere.



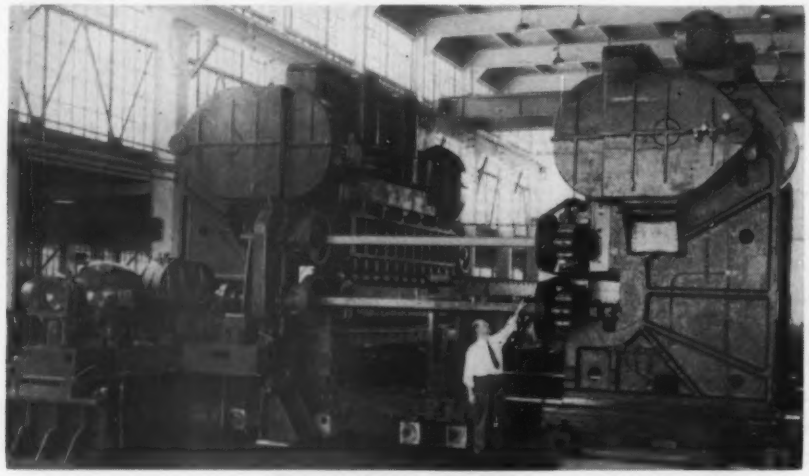
Ex-Cell-O Machine Grinds 10-ft Thread Length

Ex-Cell-O has developed a large thread grinder in response to need for machine to handle such parts as aircraft actuator screws and machine tool leadscrews. Designated Style 120, it will grind 10 ft of thread length in one setting, will accommodate work to 12 ft long between centers, and will hold close tolerances on form, pitch diameter, and lead. Workpieces longer than 12 ft can be inserted through the work spindle, and threads longer than 10 ft can be ground a section at a time, or by turning the work end over end. It is reported that the lead at adjacent sections can be picked up and continued accurately.

Automatic features include: feed to finish size; grinding wheel dressing; resumption of the grinding cycle after dressing; backlash compensation; control of coolant flow; lubrication; and retraction of grinding wheel at end of cycle.

The worktable is fully supported along the full distance of its travel. Anti-friction rollers under the table provide ease of travel. Base ways are covered at all times by a wide belt attached at both ends of table.

Ex-Cell-O Corporation, 1200 Oakman Blvd, Detroit 32, Mich

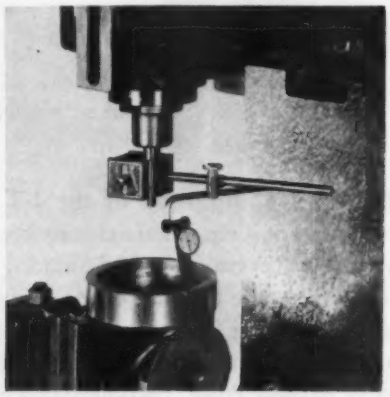


High-Speed Machine Automatically Shears Heavy-Gage Aluminum Plate

The Air Force program for heavy forging presses and rolling mills led Stamco to be asked to design a high-speed system of shearing 1¼-in. thick aluminum plates, twelve feet wide and forty feet long. The shearing line includes two side-cut shears on one end-cut shear, each driven by 60-hp motor. Plates are moved to the shears by roller conveyor tables.

The endless belt conveyor between the side cut shears feeds the plates through and holds them during shearing cycle. When side trimming long plates, the scrap is sheared off completely, automatically, before the plate is progressed. This is accomplished by short pair of shear blades set at 45° to the regular blades.

Stamco, Inc, New Bremen, Ohio



Brown & Sharpe Magnicator

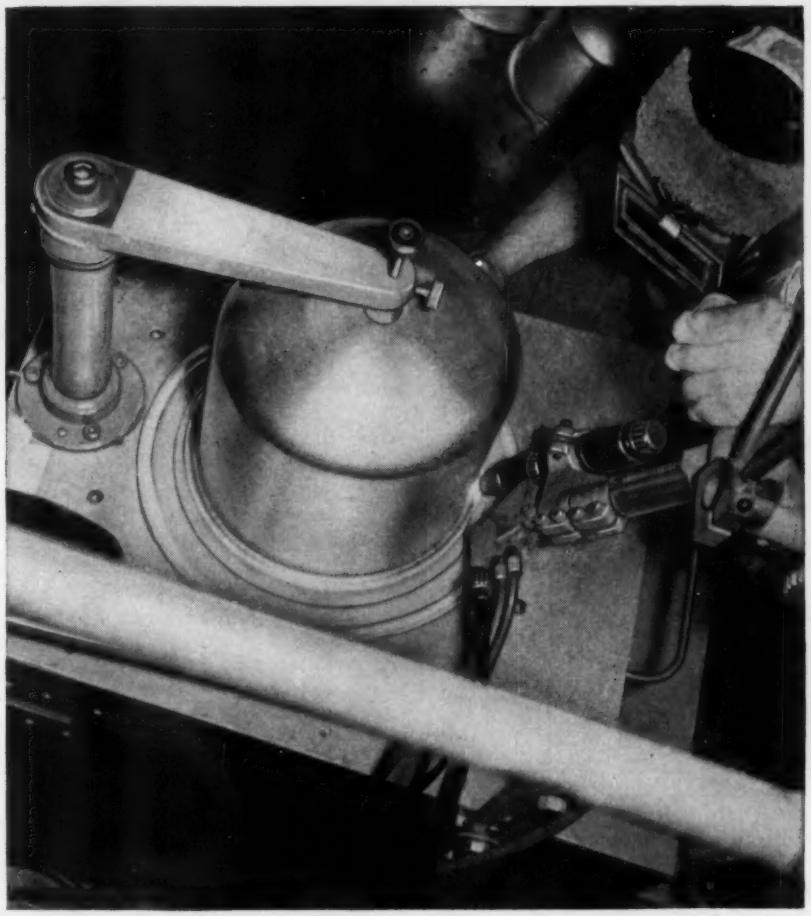
Testing stand termed Magnicator is equipped with permanent magnet base. Magnetic force is fully releasing and turned on or off by pushbutton control which permits device to be held and operated with one hand.

It can be used on any magnetically conductive surface and in any position, having three flat energized sides. An additional V-surface on the top holds to round surfaces. Design accommodates B&S dial attachment No. 725 in range of 0.030 by 0.001 in., No. 725A with range of 0.008 by 0.0001 in.

Brown & Sharpe Mfg Co, Providence 1, RI

PRODUCTION *Zooms* 1000 PER CENT

with Mechanized HELIARC Welding



A HELIARC HW-13 torch is being used to weld a 1/8-in. aluminum radar cover.

A West Coast aircraft plant is using mechanized HELIARC welding to join the components of aluminum sealing covers for radar units—the "Seeing Eyes" of the Armed Services. Welding time has been cut from one hour and 10 minutes to only six minutes and the plant now turns out eleven covers in the same time it had formerly taken to produce one. Because the HELIARC welds are shielded from contamination by an inert gas, such as argon, they require no flux and are free from porosity and oxide inclusion. This results in fewer rejections and a minimum of finishing.

LINDE's team of welding processes—HELIARC, sigma, and UNIONMELT welding—can help you cut production costs and increase quality. Whatever your welding problem—one of LINDE's electric welding processes can do the job efficiently and economically. Call your local LINDE representative today for more information.

Linde Air Products Company
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
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In Canada: DOMINION OXYGEN COMPANY
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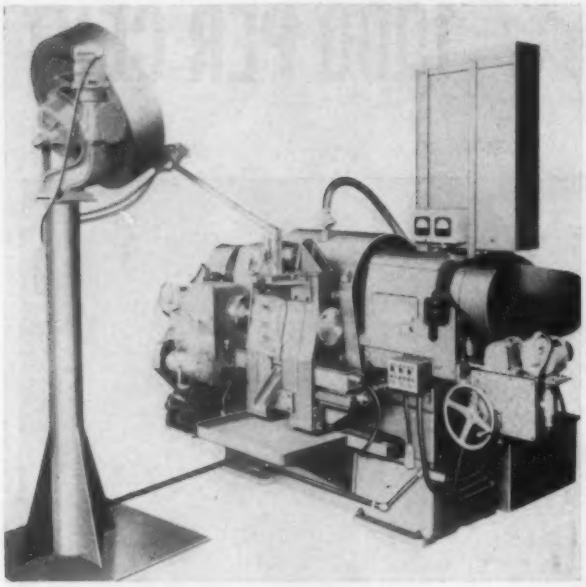
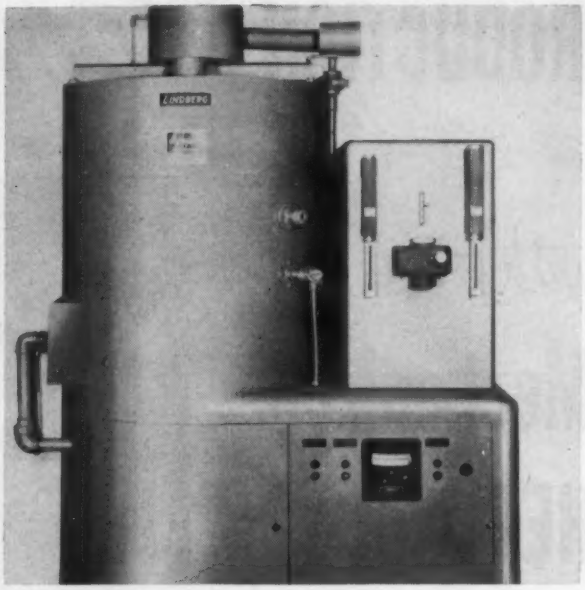


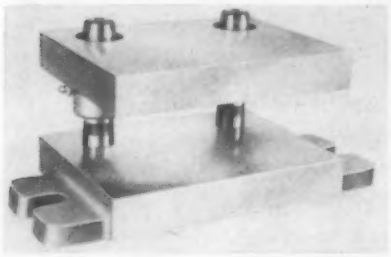


Automatic Disk Grinder Processes Piston Pins

This automatic disk grinder with hopper feed was developed for grinding piston pins. Pins from the hopper enter a stacking mechanism from which they are picked up automatically by a rotating carrier plate and clamped in hardened V's. The carrier plate revolves between opposed grinding wheels and 0.010 in. of stock is simultaneously removed from each end of the pins in one pass. Finish-ground pins are unloaded automatically through a chute into tote boxes.

Sizing devices continuously gage accuracy of the work. When wear on faces of grinding wheel is such that pins approach the high limit of tolerance, automatic feed is actuated. Production is 2100 pins per hour.

Mattison Machine Works, Rockford, Ill



Dieset Line Incorporates Design Improvements

Straight rectangular shape of Northern all-steel dieset eliminates costly curved-shape cutting from larger blanks, minimizing usual excessive scrap. Welded flanges provide adequate clamping area for mounting in press. Balanced location of posts directly behind the die area, instead of varying with different sizes, provides maximum die-working area for weight and bulk of set, making it more compact, and eliminating handling of unnecessary weight.

Entire front edge surfaces of punch and die holders are ground square and parallel with posts, facilitating layout or setup for additional machining operations, and aiding in setting of die in press for use with automatic feeding equipment.

Pins and bushings are shrink-fit assembled to avoid distortion and increase holding power. Steel punch shanks are furnished inserted. Sets are available with lamina-electroplated bronze, wring-fit bushings, in addition to press-fit types. Sizes range from 12½ x 10-in. through 25 x 14-in. die space.

Northern Tool Specialties Co, 21509 McCracken Rd, Cleveland, Ohio

Self-Locking Male Threads For Turnbuckles and Bolts

Self-locking male threads in form of aircraft turnbuckles and special bolts and screws are being made by Starloc, Inc, to meet military specifications. They report a special feature of the locking screw is the wide range of adjustment permitted with positive locking torque. Dimensions of Starloc fit standard nuts and locking feature can be added to any type of standard screw form.

Locking action is achieved by convex fiber insert in thread of bolt. The locking action does not require high torque or special tools.

Starloc, Inc, 235 Canal St, New York 13, NY

Endothermic Atmosphere Generator Offered by Lindberg Engineering

The Hyen Hydryzing generator provides fully automatic process for producing protective atmosphere for bright hardening, bright annealing, or bright brazing of steel totally free from decarburization or carburization. Available in 500, 750, and 1500 cfh sizes, generator is completely wired, piped, and assembled in package unit.

Outstanding features are reported to be: instrument panel combined with generator; main components of mixing machine panel mounted at waist level; carburetor quickly cleaned without tools; larger catalyst bed to increase cracking efficiency; standard ceramic retort interchangeable with high-alloy inconel retort; and supplied with safety equipment to meet Factory Mutual Specs.

Lindberg Engineering Co, 2450 W Hubbard St, Chicago 12, Ill

Flute Polishing Wheel

Sawco abrasive flute polishing wheel for imparting high fiinsh to taps and drills is rubber bonded. It may be easily dressed to fit contour of the flute it polishes. Self-dressing action of the bond automatically maintains proper wheel shape, reducing amount of dressing necessary, and permitting faster polishing since there is a maximum of abrasive in contact with the metal at all times.

Wheel is available up to 10 in. with face thickness to ½ in. Arbor diameters range from ¼ to 1½ in. It may be run at 8000 sfpm.

Sandusky Abrasive Wheel Co, Sycamore, Ill

Want to make more money in '55

on your second operation work?

here's a tip

GET RID OF YOUR OBSOLETE HAND SCREW MACHINES

Why continue to waste money (and, what's worse, lose business to competitors) because of high shop costs due to inefficient production machines?

this NEW Wade® no. 73 HAND SCREW MACHINE

has features that give you high production... to extremely close tolerances. Some of these features are patented — exclusive with Wade.

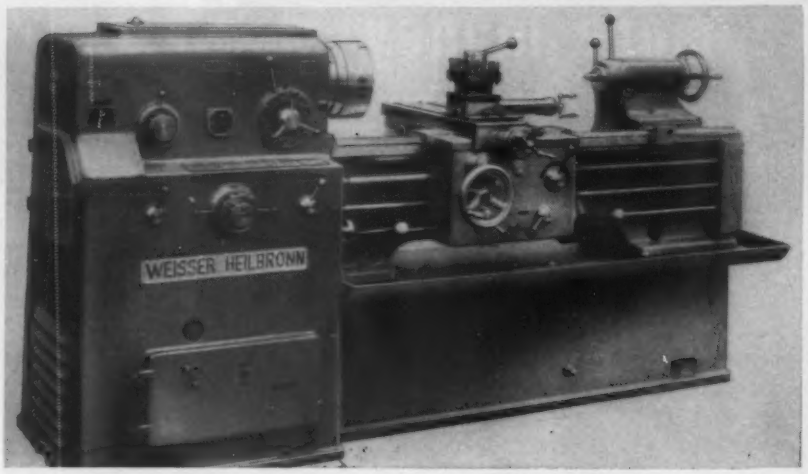
Send for descriptive circular on the **WADE NO. 73 HAND SCREW MACHINE**

Address:
53 River Street

THE WADE TOOL CO.

WALTHAM 54, MASS., U. S. A.

MAKERS OF PRECISION TOOLS FOR AMERICAN INDUSTRY



Precision Lathe Has 2-Lever Control For Range of 12 Spindle Speeds

Goliath high-speed lathe incorporates two-lever control of twelve spindle speeds: range 24-1000, or range 32-1400 rpm, through use of the star handle and back gear lever (illustrated on top front of headstock). Single control block provides all threads and feeds, eliminating need for tumbler yoke.

Machine is driven by a 3-phase induction motor of conventional design, with capacity of 7.5 or 10 hp, mounted under headstock, vibration-free, and protected against coolants. All gears are of heat-treated alloy steel, finished, and ground.

Weisser Machinery Corp, 1539 W Elizabeth Ave, Linden, NJ

Compact Tool & Cutter Grinder Has Increased Capacity

Sterling RK-2 tool and cutter grinder has up to 22-in.-dia cutters. Heavy anti-friction tables required on universal grinders have been eliminated. Instead of moving work past the grinding wheel, the spindle is mounted on linear ball bushings, and moves past the work on a hardened and ground steel bar.

Usual workholding fixtures mount on a column that moves vertically and in-and-out. Result is said to be a much more compact machine, easier to set up because all controls are grouped in easy reach from front of machine, and easier to operate because relatively little weight is moved.

Unit is said to be ideal for shops that have a universal grinder and need more tool and cutter grinding capacity, or shops that need tool and cutter grinding facilities only.

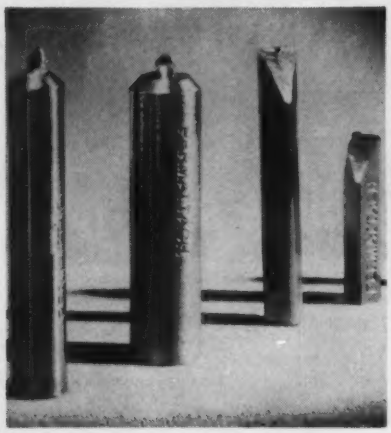
McDonough Manufacturing Co, Eau Claire, Wis

New Sintered Carbide Steel-Cutting Material

Material K21 is a new multi-purpose sintered carbide steel-cutting material with Rockwell A hardness of 91.5 plus high traverse rupture strength. Kennametal states it was specifically designed for general cutting, heavy roughing and finishing of steel products with range broad enough to get the most out of today's high speed machines, as well as to step up productivity on older, slower machines. Outstanding characteristics are said to be high edge strength, combined with superior wear qualities, and excellent resistance to cratering.

The material has reportedly demonstrated its ability in an extensive set of field tests.

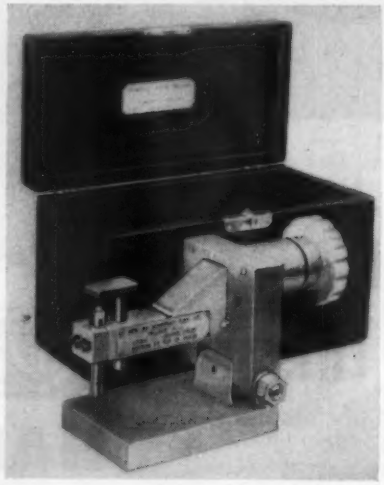
Kennametal, Inc, Latrobe, Pa



Industrial Diamond Tools

A new line of industrial diamond tools, manufactured under the Permattach process originally developed by GE, is now available. The process causes a permanent chemical union between the stone and the tool shank. Maximum utilization of the stone is insured without resetting. It is reported that many design limitations existing with conventional diamond tools are eliminated. Tools are offered in line of wheel dressing, boring, thread grinding, radius and form dressers, shaped and lapped diamond tools.

Permattach Diamond Tool Co, Inc, Milford, NH



Somerset Wheel Dresser

New model wheel dresser designed for dressing grinding wheels of most diameters maintains accuracy of 0.002 in. The SS Model is reported so simple to operate that a beginner can dress complex forms in short time. Four stops allow complete control for dressing of concave or convex radii. Unit sells for less than $125.

Somerset Tool Co, Virginia St, Hillside, NJ

here's the key to a

SUCCESSFUL MAINTENANCE PROGRAM

THE REMINGTON RAND KARDEX record combines in a single pocket, ready for instant reference, the complete history of the machine, machine characteristics, repetitiveness of repairs and a record of maintenance service and costs.

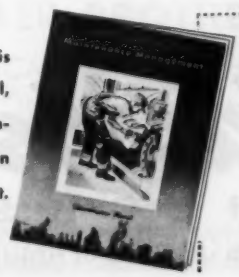
Through the use of colored signals the preventive maintenance program is visibly signalled, allowing you to analyze your preventive program at any time *in a matter of seconds.*

You will also need an inventory control system for spare parts. An effective stores control system is as important to your maintenance control program as is your work force. Without proper inventory control of parts, valuable production will be lost and machine down time will be greatly increased.

Both of these records are shown in our booklet on Maintenance Management. This booklet also contains information on how to:

1) Keep Within Your Operating Budget
2) Reduce Emergency Work Through Planned Maintenance
3) Schedule Man-Hours and Cut Idle Time

Send today for this 8-page booklet which shows in detail, in flow-chart form, how you can streamline your whole maintenance operation at the lowest clerical and equipment cost.



Remington Rand INC

Room 1670, 315 Fourth Ave., New York 10

Kindly send your free booklet "Assured Equipment Productivity Through Maintenance Management"-X1383.

Name_____ Title_____

Firm_____

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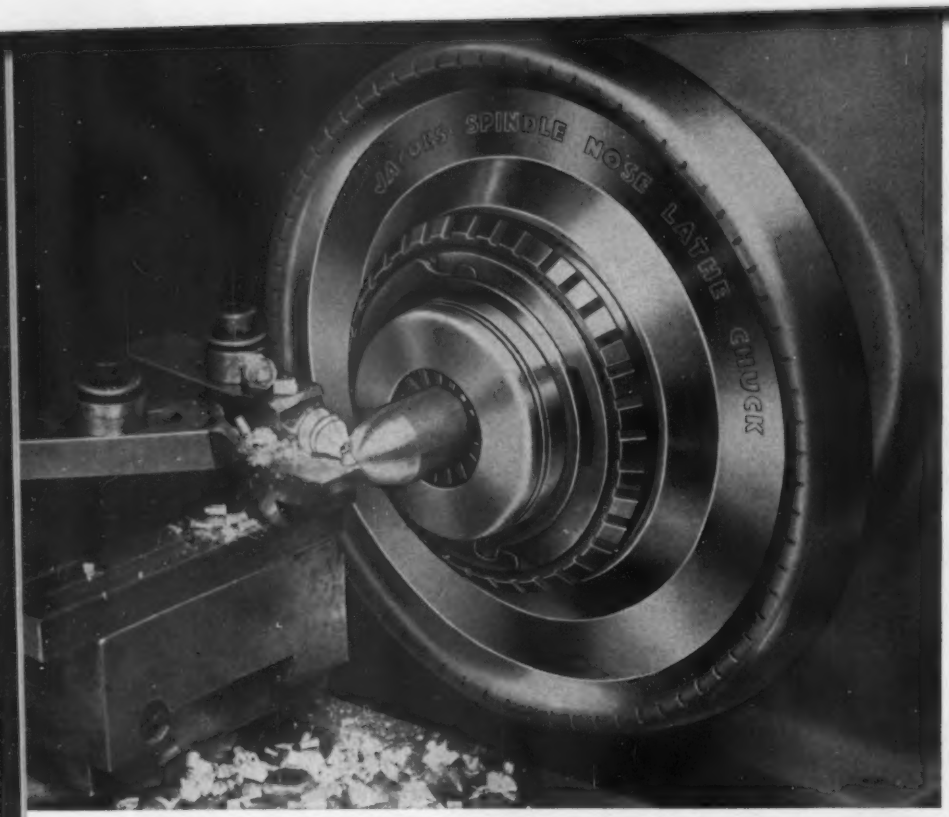


Twice the performance at half the cost!

The Jacobs Model 91 Spindle Nose Lathe Chuck delivers from two to four times more torque than any split steel collet chuck and costs less than half as much on a complete-with-collets basis.

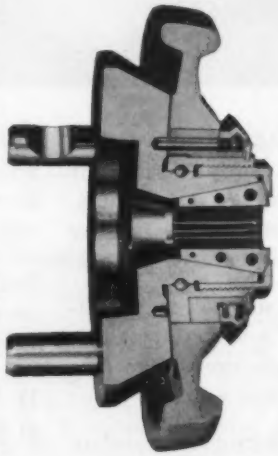
Here is the performance of the Jacobs Model 91:

Unequalled Gripping Power. Model 91 has 2 to 4 times the grip of present split steel collet chucks.

Capacity. Model 91 chucks any bar between 1/16" and 1-3/8". 11 Rubber-Flex collets cover the gripping range of as many as 88 steel collets formerly needed.

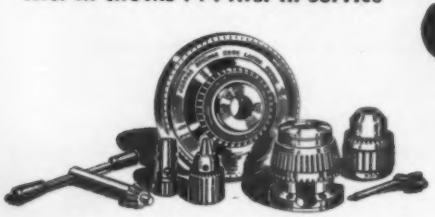
Unequalled Accuracy. Model 91 is the most accurate collet chuck in the world today.

Durability. Model 91 has a solid aluminum hand wheel. The forged body and all other chuck parts are hardened and ground alloy steel.



The Spindle Nose Lathe Chuck and the complete line of Jacobs Chucks are stocked and sold by industrial distributors everywhere. See yours, or write Jacobs Manufacturing Co., 1606 Jacobs Road, West Hartford 10, Conn. Ask for Bulletin 54A-LC.

JACOBS AND YOUR LOCAL DISTRIBUTOR
are ready to deliver the chucks you need and the service you deserve.
first in chucks . . . first in service



Jacobs
CHUCKS
If it's a Jacobs–it holds

ROUND TABLE *Discussion*

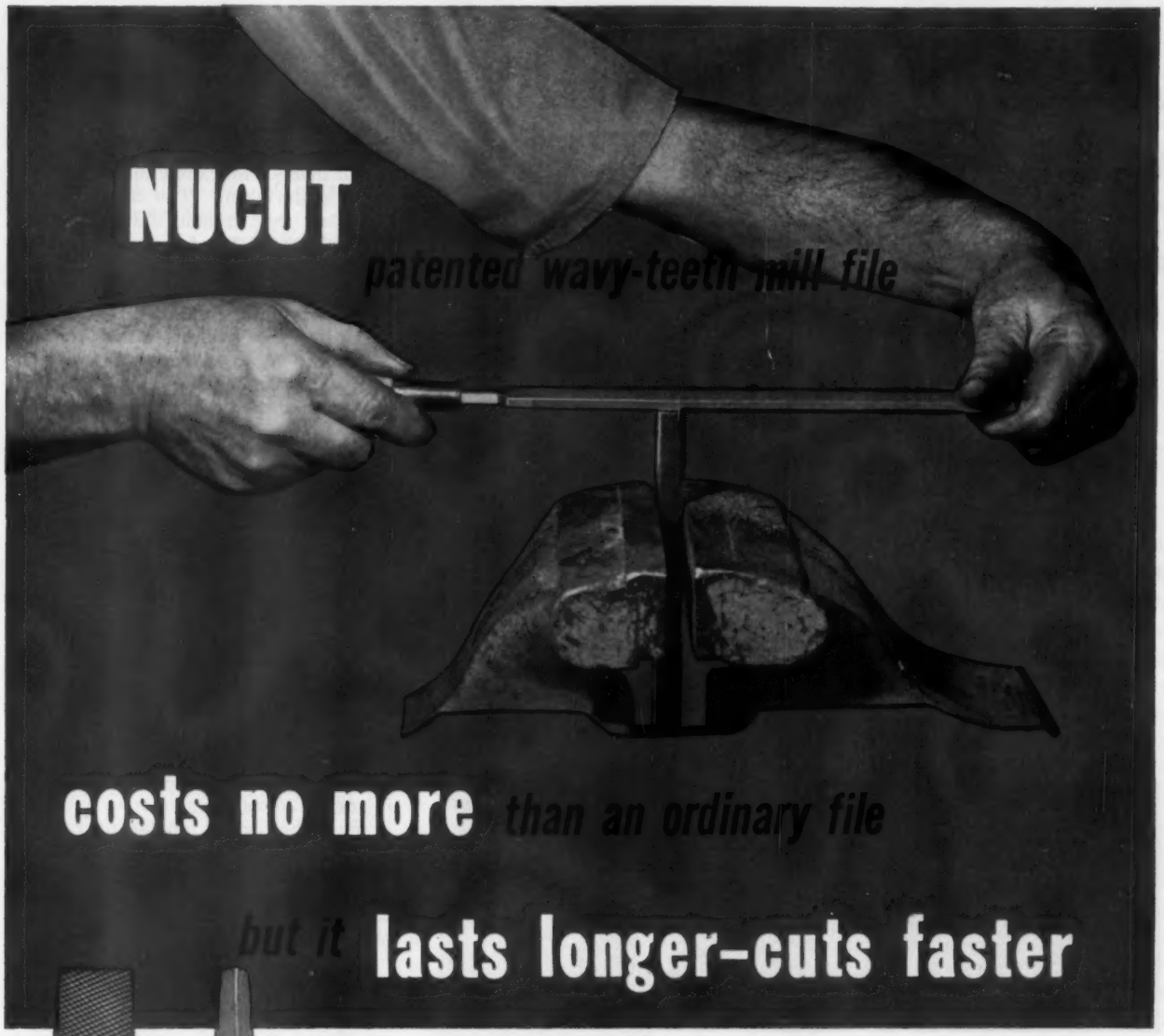
PASS-ALONG PRAISE

If the supervisor congratulates a foreman on a job done in his department, should the foreman name the man who worked on the job, or is it sufficient to simply repeat the praise to him later?

SHOULD A FOREMAN detail the credit for all work done to the supervisor or should he accept it for the department, then parcel out the compliments himself? This is a vexing question in the shops and, in certain circumstances, it can and does poison shop atmosphere even to the extent of destroying foreman - workman good fellowship. Al appears in a very bad light here, and stamps himself as a reactionary and a rank bad psychologist. We all like a pat on the back now and then, from the president down, and we all work the better for it. To some natures, money is less important, less satisfying than credit for a job well done and the problem of satisfying all the varying aspirations of the many differing personalities to be found in the modern factory is one of the first magnitude. It can't be examined too often.

No matter how good a foreman may be as an engineer or a planner, he cannot do everything himself. He can direct and guide, but others must be relied on to carry out his plans and instructions. If his planning and instruction is good, he is entitled to due credit for that; that's *his* job. If the men carry through his instructions to his entire satis-

"Who left this window open all night?"



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faction, they are entitled to credit for doing so; that's *their* job.

There is no valid reason why Al should not have mentioned to the Super, when complimented on the excellence of a given job, that Jones had made a fine show on his part of the undertaking. The Super would be less than human did he not admire Al for his fairness in giving Jones a look-in. Could Al but see it in that light, he would realize that in giving Jones a proxy pat on the back he is at the same time enhancing his own reputation in the eyes of his boss.

Al claims to have set Jones on the right road when he got stuck and Jones claims to have given Al's suggestion practical form. Possibly both claims can be justified and both should share the credit for the finished article. Al's attitude is to be deplored; it is short-sighted and dogmatic, quite unworthy of a responsible executive. It is the iron curtain to good shop atmosphere and team work, both so indispensible to high earnings and high production. Al should know better than to sour or antagonize his men; their cooperation and good will are priceless assets to him as shop foreman. He admits Jones is a good man but complains he has an inflated idea of his own importance. From this it would seem that Al has sized up Jones; he has gathered the data and pigeonholed it instead of making good use of it. He has done only half the job. If Jones is a good man, they are in short supply today and are therefore worth cultivating.

What if he *has* a good opinion of his ability? So has Al, apparently, and that area of agreement makes it difficult to understand Al's reluctance to pass on to Jones the Super's appreciation of the quality of the die job. Most foremen of experience know the value of a little "manchestering" when dealing with employees who like a pat on the back. "You might put the fluence on this

"He's speedy all-right: it takes three men to keep him and the machine going."

job, Joe; it's urgent and important, and I'd rather *you* should do it." By implication, Joe is the one and only for that particular job and if that is not strictly true, it will please Joe and he will set himself to please the foreman who knows how to put it over. A little bit of what we fancy does us good.

C Mackinnon
Glasgow, Scotland

"IF YOU ARE a self-starter your boss doesn't have to be a crank." If sorehead Jones would have carried the die job through from conception to completion without going to the foreman for starting advice and ideas he would indeed have cause for ill-feeling at not getting recognition from the Super for his unusual die setup. The facts in the case indicate that the entire credit for the job should not go to the worker; rather, the supervisor is correct in accepting the top-side compliment.

However, the foreman erred in not parcelling out the credit himself to the worker involved. A good leader knows the power of praise, even if there is some question as to whether the praise is entirely deserved. There is nothing like undeserved praise for putting human beings in a good temper. Praise not only pretends that we are better than we are; it may help to make us better than we are.

Too many foremen believe that the absence of criticism constitutes praise. The wise foreman who occasionally gives his crew a pat on the back knows that this is a good morale-builder. All of us like to be complimented for doing a good job or making a helpful suggestion. However, ill-feeling on the part of a worker is unwarranted because his foreman received commendation for a special job which the foreman conceived and the worker carried out. It was unfortunate that the foreman failed to follow through with a little honeyed praise to the man involved. He should have let his praise come from him as group leader and representative of management. He should have praised the worker in the presence of others for his efforts in working out the idea. This would not only have impressed the employee receiving the praise with the foreman's sincerity and appreciation, but would have had the effect of encouraging others to merit the foreman's praise.

Judicious praise is a valuable device used by leaders in maintaining a happy and efficient working force. A good foreman appreciates and acknowledges honest effort and above-

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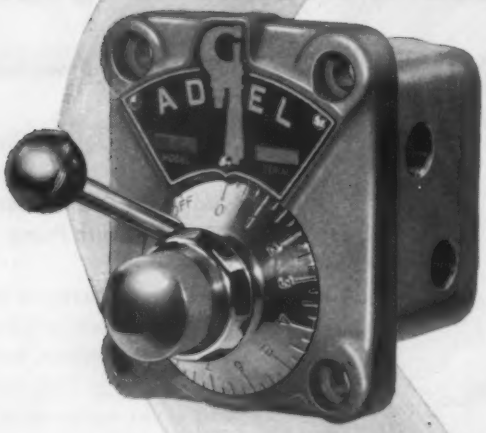

Adjustable from completely shut off position to 25 G.P.M. maximum flow. Will maintain constant fluid flow and constant machine feed over a wide range of pressures and feed resistances.
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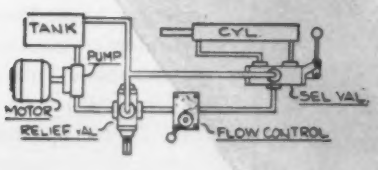

Diagram illustrates typical circuit showing control of cylinder.

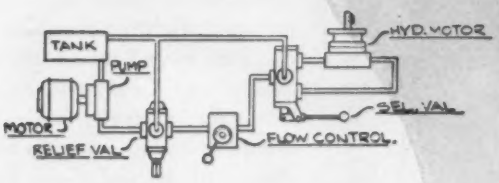

Diagram illustrates typical circuit showing control of hydraulic motor.
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average work. He gives credit where credit is due.

Personal praise, even of the pass-along variety is one of the easiest and cheapest methods for dispelling ill-feeling. The wise foreman knows that nothing can ever take the place of the spoken word, the personal contact, the friendly meeting. A foreman cannot win employee loyalty and support simply by telling them by remote control what to do. A company can buy a man's time, it can buy a man's physical presence at a given place; it can even buy a measured number of skilled muscular motions per hour or day. But it cannot buy enthusiasm, initiative, loyalty, or devotion of mind and heart. It has to earn these things.

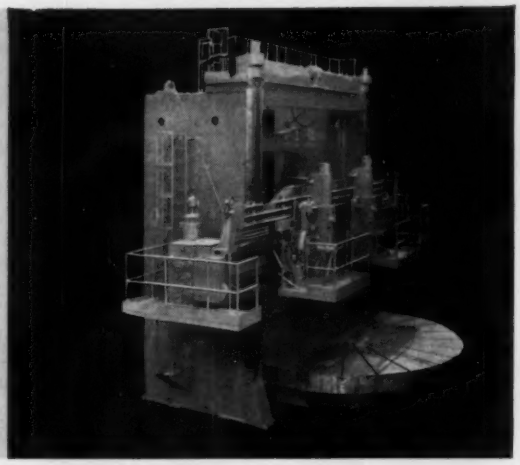
Human nature being what it is, unnecessary ill-will can be created by fancied insults. It can stem from a feeling of being left out of things, or undeserved slighting of praise for extra effort. It is an easy matter for the foreman as management's representative to clear up these misunderstandings simply by remembering what people want out of work, and seeking to supply it. Workers enjoy creative participant endeavor, working together. They enjoy the feeling of increased understanding and personal usefulness. They need praise.

A foreman should not be afraid to praise. He should realize that cash wages are paid for work, but mental wages are paid by expressing appreciation for a job well done. It's hard to understand why the foreman in the case under discussion was so niggardly with his praise and mark of approval to show the worker that he appreciated the man's ability to carry a difficult job though to completion. A friendly gesture is good psychology even on the part of

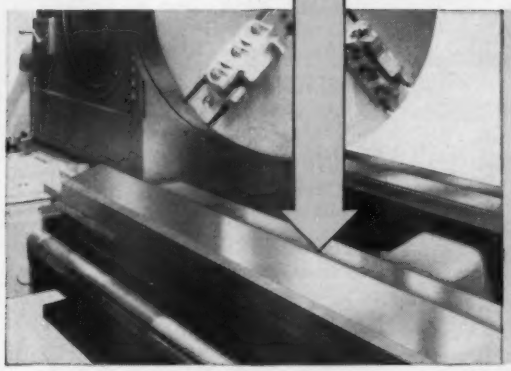
(Continued on page 212)

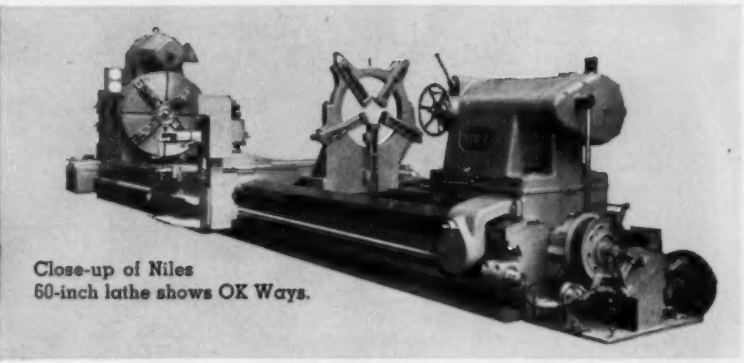
"- - How can you be late to the shop every morning when you only live five hundred thousand miles away?"

Table of Niles 20-foot vertical boring mill, inverted to show OK Wear Plates.



good ways to keep customers happy





Close-up of Niles 60-inch lathe shows OK Ways.

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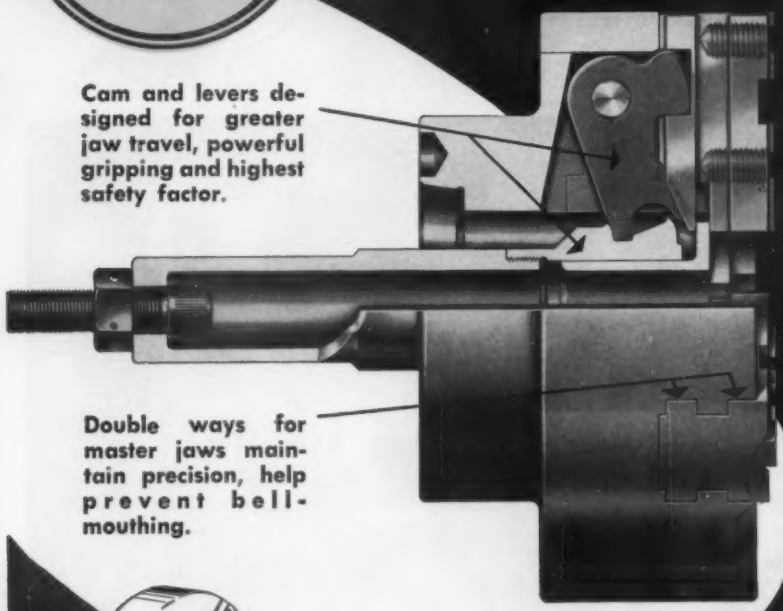

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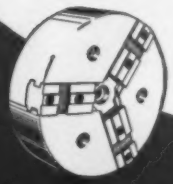

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a foreman. But I suppose a foreman is also subject to the same human frailties as his workers. We all want to be liked and respected, but we are far from perfect.

Foremen Al showed a surprising lack of tact in detailing the credit for all the work to himself instead of accepting it for the department and then parcelling out the compliments himself. It was improper and tactless to withhold commendation for the deserving worker. Managers of men should remember that they are directing men and not machines —the occasional friendly word or judicious praise often gives a spur to more effective work.

Al would do well to swallow this capsule of wisdom: "Praise is never wasted except when you give it to yourself."

Harry Kaufman
Philadelphia, Pa

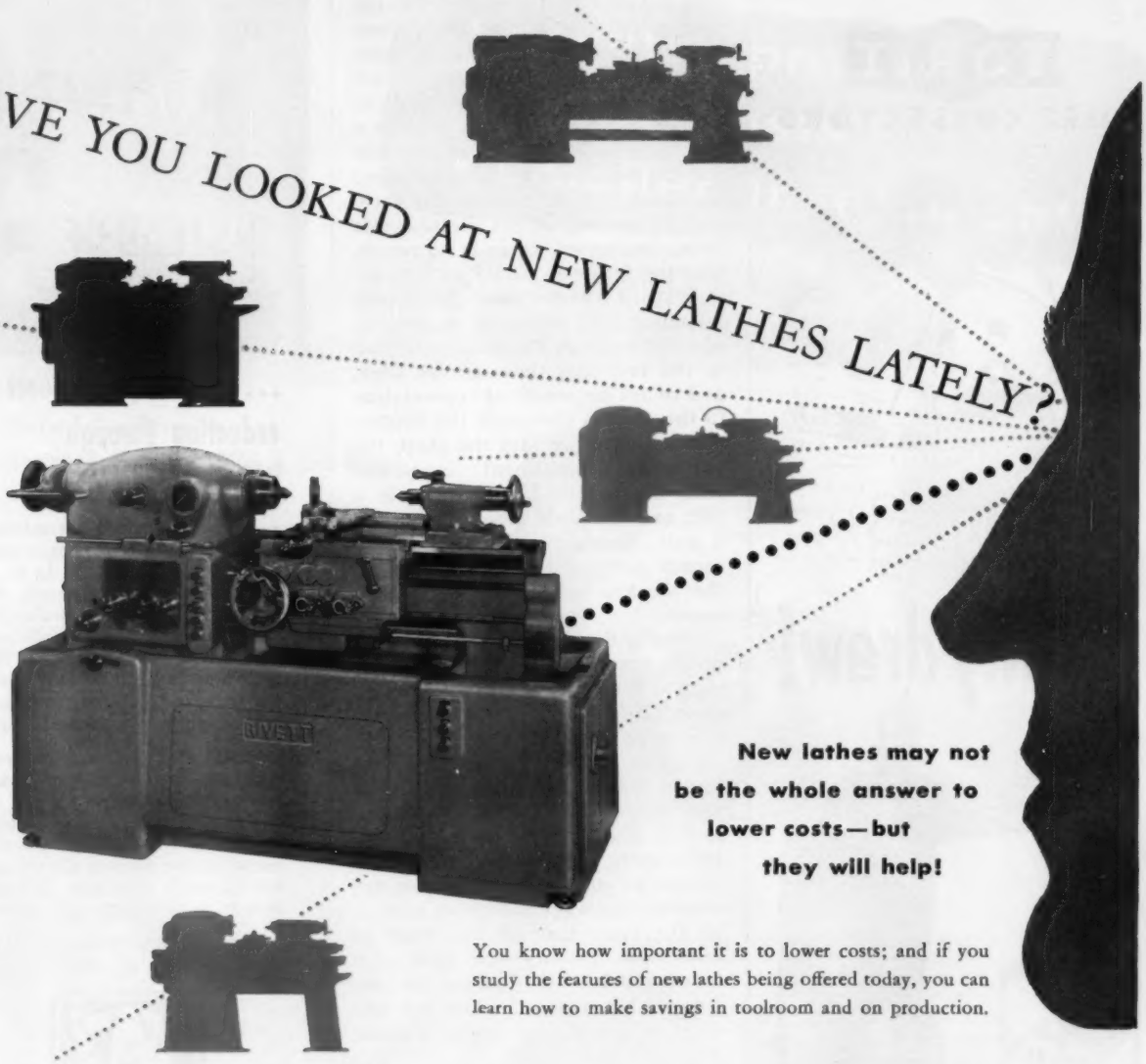
GIVE CREDIT where it is due is my motto, but this credit should come for exceptional service, not the service for which the man was hired. It is not up to the individual to determine when he should receive praise, although there are times when he feels that he should have some recognition for something that he has done out of the ordinary.

There are some people who are constantly on the lookout for praise; they think that whenever they do something extra the boss should fall all over himself.

Obviously it is the duty of a worker to perform in a manner for which he is paid. There is a tacit understanding between employer and employee that they will do their best for each other. Whoever does not carry out this understanding is bound to be the loser in the long run. The worker should realize that

"Try to get it straight this time. The coffee goes in screws, sugar goes in bolts, crackers go in washers . . ."

HAVE YOU LOOKED AT NEW LATHES LATELY?



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Rivett offers two lathes for one!

This observation is particularly true if you look at the new Rivett Model 1020S Precision Toolroom Lathe. It features sensitivity for turning tolerances within .0004″; and heavy biting ruggedness for a ¼″ cut at .020″ feed in cold rolled steel. In short, it is an instrument lathe and an engine lathe combined to handle any work within its 12½″ swing and 20″ centers.

26 Features Distinguish Rivett 1020S

The Rivett Model 1020S is head and shoulders above any ordinary lathe. Its design includes 26 individual qualities that substantiate Rivett's reputation for extreme precision and economical production.

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Why not write for the new Rivett Catalog 1020B and read these important 26 features—compare them with the designs of other makes of lathes—and thereby realize what a Rivett can do for your shop in the way of time and money (not to mention how happy it will make any *real* machinist to work with such *real* precision!)

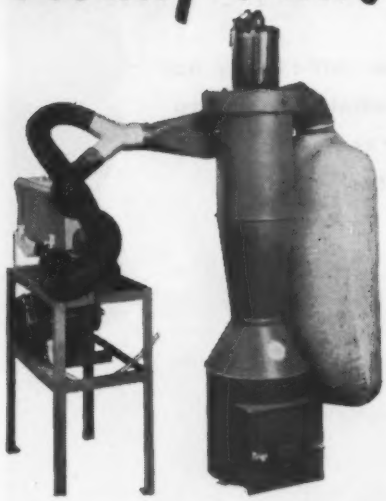
RIVETT

RIVETT LATHE & GRINDER, INC., DEPT. AMR 6, BRIGHTON 35, BOSTON, MASS.

See Model 1020S in action during Machine Tool Show at booth 805.

TORIT
DUST COLLECTORS

Really draw!



A size and model to solve any dust collecting problem, Torit collectors provide complete, all-around dust control. Torit collectors are unitized for custom installation on each machine, giving power and suction only when machine is operating. Keeps plant and machines free from clogging and unsightly dust. Furthermore, cleaned and filtered air is exhausted back *into* the room maintaining heat balance. Find out now how Torit unitized dust control is engineered to your problems.

See our catalog in Sweet's Machine Tool File, or write:

TORIT
MANUFACTURING CO.
280 Walnut Street • St. Paul 2, Minn.

the foreman cannot go around slapping his men on the back for doing their very best while doing their regular line of work. However, there are outstanding performances which justify the shop foreman putting himself out sufficiently to apprise a man that his efforts are recognized.

If the superintendent, or whoever stands on the rung above the foreman, is passing on his compliments to his lieutenant, there is no reason why the foreman should go into details about who did what. The superintendent isn't interested directly in who did a certain job; he is interested in the fact that the job was done, and relays his words of appreciation to the man in charge of the department. Remember that the shop, the particular department concerned with the output of the work, is a unit and it should receive credit as a unit. Shops, like football teams, cannot perform at their best if all the workers want to be quarterbacks.

"You're doing a fine job, Ed; keep up the good work," implies that the shop as a whole is to be commended in spirit and no man in particular is singled out. Your foreman will recognize any exceptional undertaking in time, so keep on doing your very best and be happy in the satisfaction that you are doing so. Unfortunately there are men who are in charge of some shops who are scoundrel-minded and strive to suck all the glory through the straw of selfishness. Usually this kind of a foreman doesn't stay on the job long because his men soon find out just what he is and label him as a crook, which he certainly is.

I see no reason why a shop foreman shouldn't receive a pat on the back for what the department is doing, as it is certain that he gets

"I've given you the best years of my life - - - what the hell's the idea of all the time slamming me on the finger?"

1 OPERATION INSTEAD OF 3

...an example of cost reduction through W&S tool design...

A large electric meter manufacturer asked us to design a single small precision tool to do in one operation the work formerly done in three. The double-ended tool we made to their product specifications cost just half as much as the three tools it replaced; it reduced production time; and it eliminated multiple error along with multiple set-up.

Woodruff & Stokes specialize in small tool design and manufacture. For example, supplying small cutting tools requiring diameter tolerance of ± .0002" or closer and as many as five cutting diameters is not unusual. Woodruff & Stokes have made these tools their business.

How can W&S help you? Write today for complete information.

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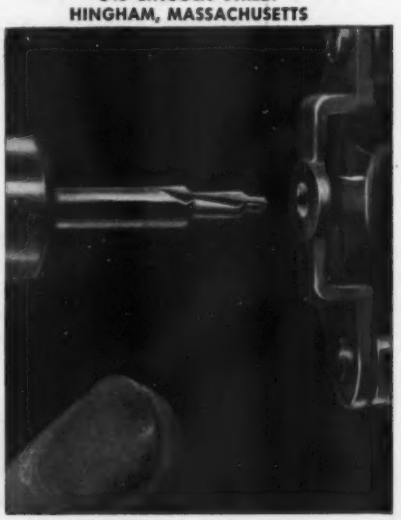


MBI

• greater production
• lower costs
• smaller investment

PRECISION DESIGNED AND BUILT TO MEET THE REQUIREMENTS OF THE AGE OF AUTOMATION

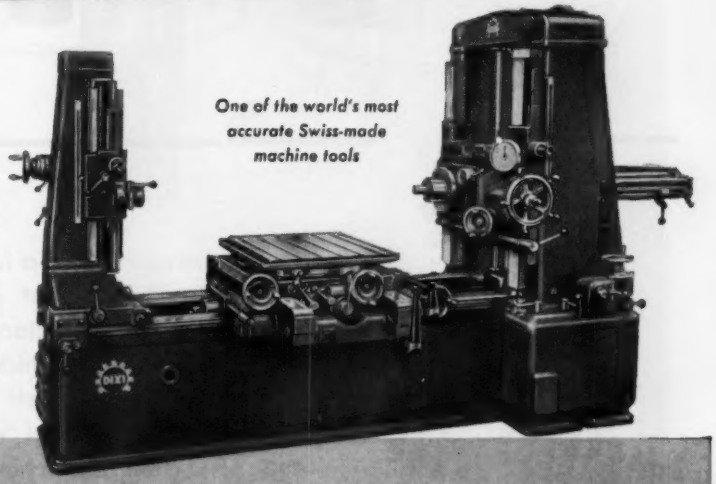
Dixi 60 Combination

Horizontal Boring Mill & Jig Borer

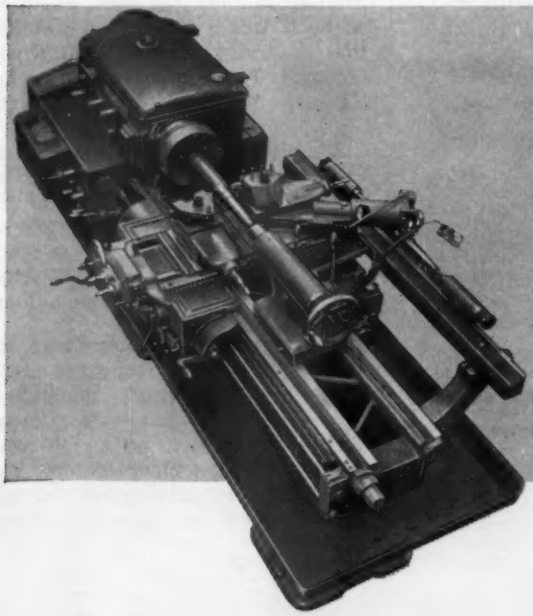
With 5 optical microscopes

A precision machine for boring, drilling, recessing, and milling work. Built-in rotary table with optical microscope can be rotated 360°. Headstock, column, and table settings by optical microscopes to insure overall accuracy of .0002". Table and spindle head have variable hydraulic feed. Mechanical spindle feed can be changed without stopping spindle and is provided with automatic depth stop.

No. 40 taper spindle. Spindle speeds 32-1350 R.P.M. Feeds .0015"—.010" per rev. Table size 28¾" x 32⅝" max. distance spindle to table 19¾". Table travel 23⅝". Spindle travel 24.4".



One of the world's most accurate Swiss-made machine tools



Heavy Duty Lathe *High Precision, Reliability, Top Performance Schaerer Model UN-450*

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permit rough turning and finish turning in the same operation in many instances. Swings 17¾" over bed, 9" over carriage, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M.

Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

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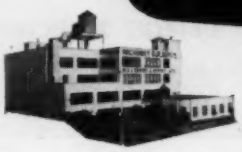
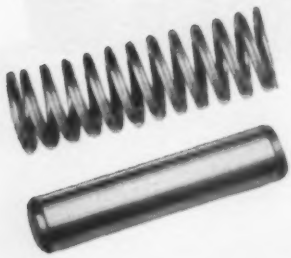


Our Headquarters in New York City

A die is no better than its die set

The big advantage of a *full-value* Detroit Die Set is that you get what you specify... factory-tested to assure you exact thickness of die holder and punch holder, true parallelism and squareness of surfaces, precision fit of pins and bushings. This means not only the accurate die set you expect, but also faster mounting, less maintenance, longer life. Reworking a die set in your shop can cost many times the difference between a "bargain" die set and a *full-value* Detroit Die Set.

And, remember, our stock die sets are shipped within 24 hours; specials in remarkably short time.



PRECISION-BUILT ACCESSORIES

In stock for immediate delivery is an extensive range of die-makers' accessories, including the new self-oiling guide pin bushings.

Detroit DIE SET CORPORATION

2895 W. GRAND BOULEVARD • DETROIT 2, MICHIGAN

Offices in Principal Industrial Centers

his share of hell often enough. It is up to the worker to be a good Joe and think a little more about the benefits of the whole department and not spend so much time reaching out for decorations for himself. Try to see that your foreman is getting something besides a headache and you'll soon realize that things will come your way a little faster. Remember that he has plenty of these, but he doesn't pass them on to you knowingly.

It has always been my opinion that when a job merits unusual notice the foreman should share its praise as well as the worker, who will get his through the foreman. The big chief, the one who pats the foreman on the back, is too busy with his job to listen to a lot of prattle about who did what and, in time, the foreman relays the comments in the regular course of events. A certain troublesome forming die may operate successfully, after one of the workers manages to overcome an annoying feature, and the big shot is so delighted that he comes to Ed and expresses his great delight in seeing the end of the trouble. Ed may mention the fact that one of his men, calling him by name, had worked out the solution but the big boss, engulfed as he is in his larger vision, takes that as a matter of normal workmanship. There will be an occasion when the man will be rewarded for his effort and assuredly will receive the merits of accomplishment, not only by his standing as an unusual worker attending diligently to his business, but when the time comes for wage readjustment.

Rex Warren
Waterloo, Iowa

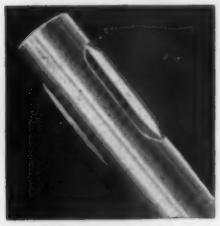
A FOREMAN should always take advantage of the opportunity to justly praise those working under his supervision. By praise we mean verbal recognition of a job well done. We do not mean flattery. The industrial worker despises flattery. He respects truth, sincerity and ap-

". . . Suppose you could whistle something other than the 'Waters of Minnetonka?'"

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

They Wing Screw Drivers at Fast Clip with Dies of BTR

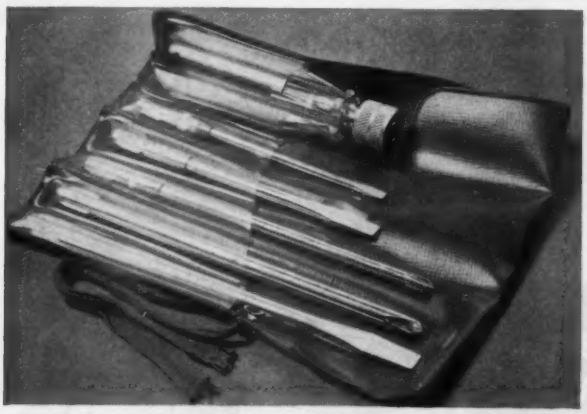


It's efficiency-plus at the busy plant of Oxwall Tool Co., Ltd., Oxford, N. J. For here there's every kind of machine for the high-speed manufacture of all kinds of quality screw drivers. They turn them out by the millions, large and small, including an ingenious worm-like screw driver which can be bent around corners at the touch of a finger.

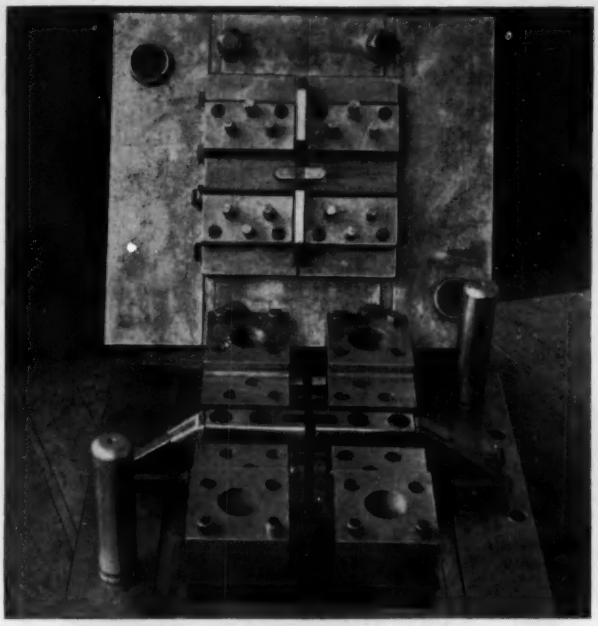
The plant has a battery of 10-ton presses where the wire blank is winged on the end opposite the blade (see illustration above) so that it can be anchored in the plastic handle. The typical forming dies used in this operation are made of BTR (Bethlehem Tool Room) tool steel. Oxwall engineers tell us that these BTR dies, hardened to Rockwell C48-50, are giving long service life in this application.

BTR is our general-purpose, manganese-chromium-tungsten grade of oil-hardening tool steel, perhaps best known for its safe hardening property. It also has good abrasion-resistance and toughness, and is ideal for practically every application where long wear is desirable.

If you would like to give BTR a workout in your shop just put in a phone call to your Bethlehem tool steel distributor. You'll find him well stocked with BTR, and anxious to be of service to you.



Assortment of screw drivers made by Oxwall Tool Co., Ltd. Each blank is winged by a die of BTR tool steel, for firm anchorage in handle. Model shown in illustration at the upper right, with flexible shaft which can be bent as needed, is an ideal time-saver for cramped quarters.



SHOCK-RESISTANCE PAYS OFF AS DIE MADE OF 67 CHISEL PUNCHES HOLES IN HIGHWAY GUARD RAIL

Because of its excellent shock-resisting properties, this die of Bethlehem 67 Chisel tool steel provides economical punching of bolt holes in beam-type highway guard rail. The die, hardened to Rockwell C-51, operates in a 200-ton press. In addition to its shock-resistance, 67 Chisel is wear-resistant, making it ideal for such applications as shear blades, hot-work tools, blanking tools and swaging dies.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Here's How to Harden Tools with Holes

Ordinarily holes in tools cannot be eliminated. Nor can their size or location be changed, in most instances. So steps must be taken to control the ill effects of holes, such as tools cracking during the hardening operation. Although it is impossible to outline a procedure for all tools, the following principles are recommended for those containing holes:

1. Quench tools so that the internal surfaces of the tools harden completely. When holes are relatively large, no special attention may be necessary; for small holes, flush-quenching may be required.

2. If it is possible that effective quenching may not occur completely throughout the holes, pack them so that hardening cannot take place in the holes, assuming that this condition is allowed on the tool. Use clay, asbestos, steel wool or steel inserts.

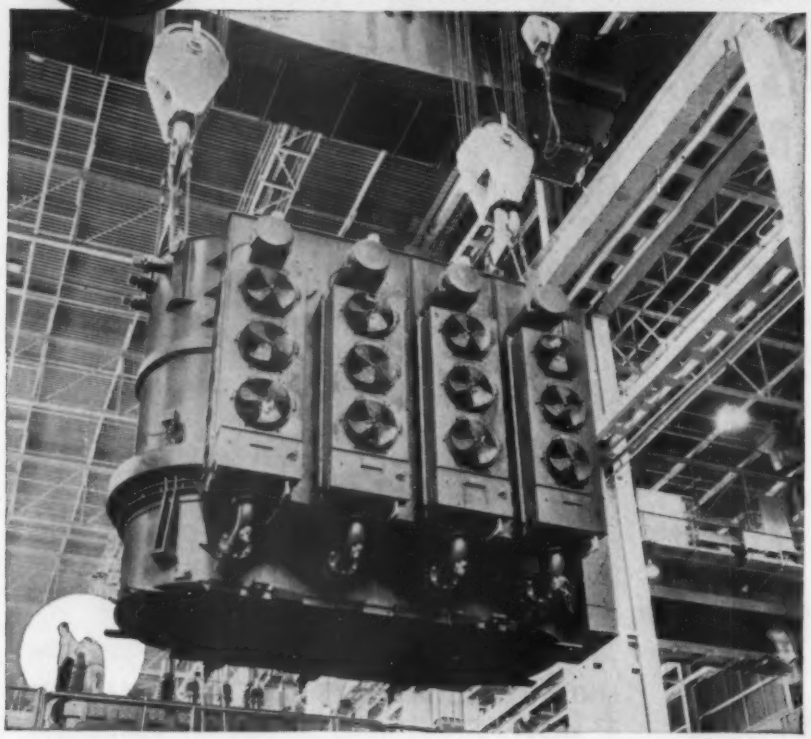
3. If only the surface of a hole is to be hard, as on a ring die, flush-quench the bore while protecting the outside surface from the quench.

The internal surface of a hole should be either uniformly hard, or uniformly soft. The worst possible condition is an irregular hardness pattern on the inside surface, because the high stress developed may result in cracking.

ACCO products

ACCO Registered* Wire Rope Slings

THE STANDARD OF EFFICIENCY AND SAFETY



You Can't Afford Not to Use Them!

• Materials handling is ticklish business. A dropped load can mean disastrous financial losses through ruined material and equipment, plus disrupted production schedules.

That's why more and more manufacturers are standardizing on ACCO *Registered* wire rope slings for all lifting operations. For ACCO *Registered* slings incorporate extra safeguards which make them the safest slings available.

Each individual component, made from the highest quality material suited to its use, is tested before assembly—must prove to have strength equal to or greater than the sling body. These components are then assembled into slings according to precisely engineered designs which have proven their safety and reliability in extensive field tests.

Each completed sling is then proof-tested at twice the load-carrying capacity for which it is rated. Then and only then does it receive the coveted registration certificate and tag.

Compare this rigorous quality control, precise design and manufacture, and extensive testing with the necessarily hit-or-miss methods used in producing "home-made" or hand-assembled slings. You'll see why ACCO *Registered* wire rope slings are safer.

And ACCO *Registered* slings cost less to use. Carefully engineered and precisely manufactured, they last longer, reduce overall lifting costs.

Get the details on ACCO *Registered* wire rope slings from your distributor, or call the nearest ACCO district branch below.

FREE SLING NOTEBOOK
Fifty-six page booklet includes data on sling use, tips on sling care, rated capacity information on all types of wire rope slings. *Write today for your copy.*

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Wire Rope Sling Department
AMERICAN CHAIN & CABLE

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Better Value

preciation from one best qualified to give it, his foreman.

The foreman is that part of management most directly associated with the worker. His problem is to develop the utmost of capacity residing in the worker. To do so he must have the capacity of truly appreciating the efforts of the worker. He must understand the nature of the worker.

Workers accomplish more for foremen who are pleasant to them, who give credit where credit is due. We all enjoy working for those who appreciate our efforts, and take the pains to tell us so. Everybody wins and nobody loses when praise is passed along.

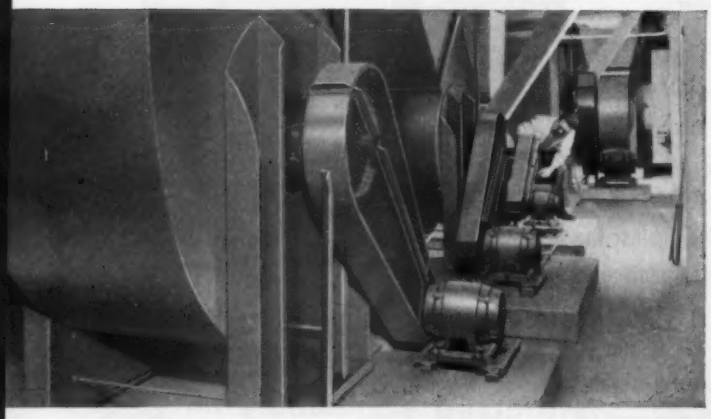
The trained and educated foreman distinguishes the worker from his work. He appreciates the fact that the worker is not only trying to make a living but also to build a life. A word of praise for a job well done puts a little more meaning, a little more satisfaction into that life. Pass along the good word at every opportunity.

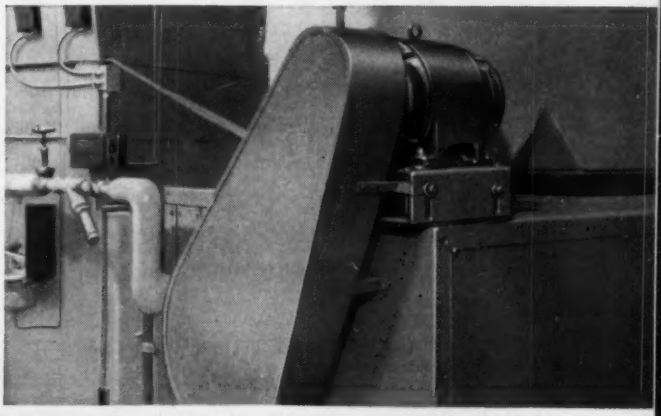
Man's inherent desire for personal worth and dignity, for recognition and approval is not entirely satisfied by good pay and good working conditions. Statistics prove that industrial workers are doing a great job. Tell it to them.

Statistics also indicate that approximately seventy percent of industrial employees leave their jobs because of social reasons. This turnover increases the cost of a manufactured product. It creates inefficiency. It impairs one's competitive position. Liking and being liked is essential to the contentment of an industrial employee. Passing along praise gives an employee the idea that he is liked, appreciated and wanted. He feels that he belongs.

Employees who feel that they

San Francisco International Terminal's Ideal Climate





Created by American Blower

Air—fresh air, and plenty of it—is supplied to the 16,000 daily passengers at the new San Francisco International Airport Terminal Building by American Blower equipment.

The fifty supply and exhaust fans are driven by powerful Fairbanks-Morse motors—selected to fit the prime requirements of quiet, dependable, efficient performance at low cost, and with little maintenance.

Powered by Fairbanks-Morse

When next you look for quiet, efficient, low-maintenance motor performance—look for the famous F-M Seal and see the difference that quality makes. Fairbanks, Morse & Co., 600 South Michigan Ave., Chicago 5, Illinois.

FAIRBANKS-MORSE

a name worth remembering when you want the best

ELECTRIC MOTORS AND GENERATORS • DIESEL LOCOMOTIVES AND ENGINES • PUMPS • SCALES • RAIL CARS • HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

for multiple-unit nut running operations

APEX Surface Drive SOCKETS

Surface Drive Socket

Standard Hex Socket

The large openings at the six corners of the hex allow Apex surface drive sockets to slip quickly and easily on the head of the bolt or nut. This floating action makes these sockets ideal for use on multiple-unit nut running work, where perfect alignment of tool and nut or bolt is not always possible.

This particular broaching design also allows the socket to drive against the centers of the flats of the hex head fasteners, preventing wear and damage to nuts and bolts.

Surface drive sockets are just one of the many types of Apex nut running tools. If your nut running operations call for impact tools, Apex can furnish sockets, extensions, adapters and universal wrenches specifically designed for this type of work. Or, if you need sockets for high-speed production work, Apex can supply these, too.

In short, whatever your nut running problem, Apex either has the solution or will work with you to find it. Catalog 29 lists more than 5,000 solutions; write today, on your company letterhead please, for your copy.

APEX TOOLS

sockets, extensions, adapters

THE APEX MACHINE & TOOL COMPANY
1026 S. Patterson Blvd. • Dayton 2, Ohio

belong make the best workers. They come to work every day, on time, and put forth their best efforts. Have a good word for those working under your supervision. Praising your men once in a while is not enough. Do it every day if possible. Most industrial operations are well performed, always. The man in the shop deserves much credit for this. There is no need to be stingy with your praise.

Peter A Seward
Swampscott, Mass

WHY NOT be a little more liberal with praise—it costs nothing, but lots of interest might be gained for the company. Although it is impossible to judge the value of Jones' gripes when the details of the die he made and the idea given him by Al when he got stuck, are not known, it seems to me that even if Jones once got stuck on his job he should get credit for it when finished, irrespective of the instructions given him by Al.

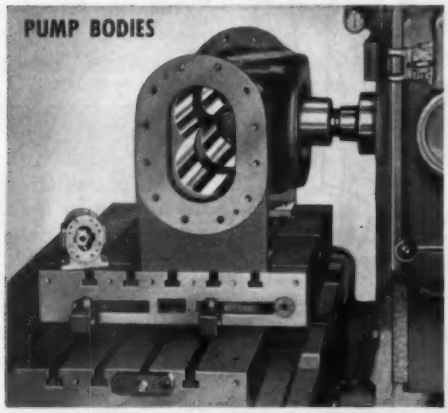
It is probably rather common that supervisors of a certain kind take the credit due to those under them. Especially those foremen and strawbosses who are uncertain in their own positions and not adequately skilled in any particular trade. They want to show their independence and make careers at the cost of others. Some of them do not hesitate even to lie to management to gain their aims. We know that some of them are appointed because they know how to use the whip, but cannot give their guys any intelligent instructions about their work. Others are only relatives to high brass but do not know much about the work they are put to supervise. If Al is that kind of a foreman, he should be given a cold shoulder by everybody under him. As Harrison complimented Al for a first-class job done

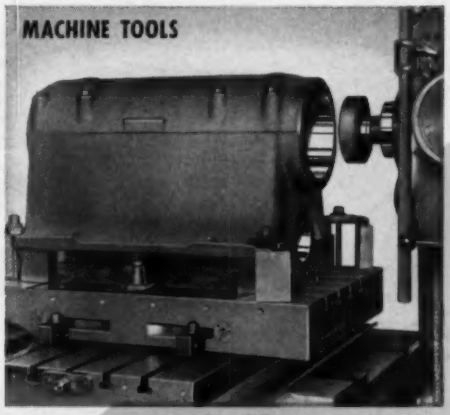
"The boss is crazy over my work but they're going to let him out soon."

The DeVlieg System of

*JIGLESS PRODUCTION

. . . eliminates expensive boring jigs!





TYPICAL EXAMPLES OF JIGLESS PRODUCTION ON DE VLIEG JIGMILS

The JIGMIL Technique:

- ELIMINATES SPECIAL BORING JIGS
- REDUCES MACHINING TIMES
- PERMITS USE OF SIMPLIFIED TOOLING
- IMPROVES ACCURACY WITH RESULTANT CUT IN ASSEMBLY COSTS

The DeVlieg System of Jigless Production permits complete flexibility of product design!

If your shop is burdened with costly boring jigs and special tooling, it will pay you to investigate the

DEVLIEG *SPIRAMATIC* JIGMIL

Come to Detroit—

see a practical demonstration of the JIGMIL TECHNIQUE

Write for comprehensive Illustrated Catalog

DEVLIEG MACHINE COMPANY • 450 Fair Ave., Ferndale • Detroit 20, Mich.

"Pete's really 'in the chips since we started using MOLITE® SMOOTH CUT!"

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Producers of fine tool steels — All types immediately available through Sales Offices, Warehouses and Representatives in Principal Cities.

TOOL COLUMBIA STEELS

Illustrated is a Sidney Model 16 lathe equipped with a Gusher Coolant Pump

DOES EVERYTHING WELL

Ruthman GUSHER coolant pumps

Check these features that give your Gusher Pump —

Better Performance — Split second copious coolant flow with no priming necessary.

Longer Life — Electronically balanced rotating shaft to minimize wear and vibration.

Less Maintenance Cost — No packing necessary with Gusher Pumps, eliminating resultant friction.

Always specify Ruthman Gusher Coolant Pumps on your metal cutting machinery.

THE RUTHMAN MACHINERY CO

1818 Reading Road Cincinnati, Ohio

by Jones, I doubt that he is a good superintendent. He should know the detrimental effect in the whole shop of an act of that kind. Under no conditions should anybody overhear such comments.

I think Al is underestimating Jones' skill when he says that he gave him the idea of a setup, and he went on and finished the job. So, Al thinks complicated dies are made by ideas? A statement of that kind reveals a great unfamiliarity with diemaking. Any mechanic may throw ideas about him, but it might take 10 years of practice to carry them out in a finished die. It takes a lot of fancy brainwork to make any complicated die, so this claim is no defense for stealing another man's credit. This kind of cheat may also hit a foreman if the shop is run by a manager of low character.

If Jones, as Al says, is a good man, he knows how to make any setup. It is not silly to admit that Jones worked the idea out and made it practical; to believe that a germ of an idea is the important thing in making tools is very silly. It is not fair to claim that Jones has an inflated idea about his own importance because he wants credit for the work he has done.

Al should have passed Harrison's compliment on to Jones as soon as he talked to him after Harrison's visit. That would have given Al many times the value of the Super's praise, which he kept for himself, in the form of good will from his workers.

Jones might not get mad about Al because he didn't pass the credit along, but he will not have the same interest in his work if he is treated the way Al is telling Ed. Not only that, it will affect working efficiency in the whole shop. It is incredible that Al doesn't understand this. A

"I hate to tell you this, but we forgot to take out your payroll deductions."

For less tumbling time ... lower finishing costs

Borolon®
TRADE MARK

TUMBLING ABRASIVE

HARD • SHARP • TOUGH • UNIFORM

Fused crystalline aluminum oxide . . . in lumps, nuggets, chips, grit or grain. Borolon tumbling abrasive cuts fast and is the ideal mass media for deburring, removing flash and bead, putting a radius on small parts . . . and giving a precision finish even to micro-inch specifications. Full range of sizes. Send for catalog bulletin ESA 236.

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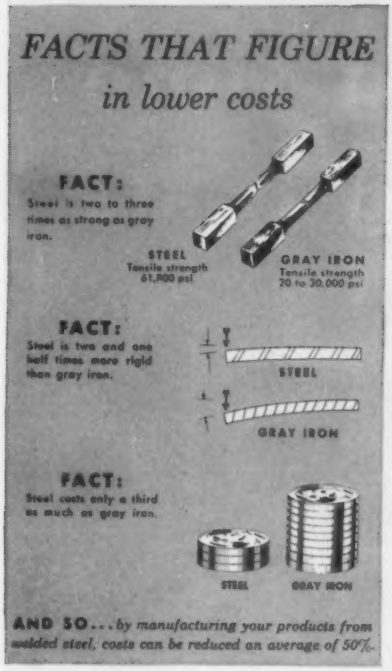
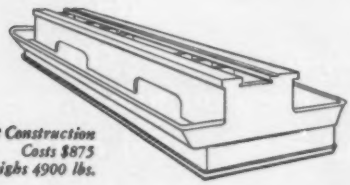

FACTS THAT FIGURE
in lower costs
FACT:
Steel is two to three times as strong as gray iron.
STEEL
Tensile strength 61,900 psi
GRAY IRON
Tensile strength 20 to 30,000 psi
FACT:
Steel is two and one half times more rigid than gray iron.
STEEL
GRAY IRON
FACT:
Steel costs only a third as much as gray iron.
STEEL
GRAY IRON
AND SO... by manufacturing your products from welded steel, costs can be reduced an average of 50%.

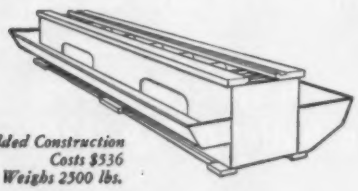
SAVES 38% ON COST WITH WELDED DESIGN

● Here is how you can apply the benefits of greater strength, higher rigidity you get with steel to your designs.

Savings of $339 are realized on this machine base by changing over from cast iron to welded steel construction. Even though 2400 fewer pounds of metal are used, the steel base is actually 45% more rigid to resist deflection under load. Result: Greater accuracy of alignment . . . at lower cost of manufacture.



Cast Construction
Costs $875
Weighs 4900 lbs.



Welded Construction
Costs $536
Weighs 2500 lbs.

PUT THESE BENEFITS TO WORK—Ideas on designing for low cost with steel are in Lincoln WELDesign Bulletins, available to designers and engineers. Write.

THE LINCOLN ELECTRIC COMPANY
Dept. 2004, Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

good foreman should be above such intrigues. Harrison's compliments passed on to Jones would not have lessened his own credit but doubled it with good feelings for everybody concerned. The guys would have respected him more after such fair dealing. A pat on a man's back if he deserves it should always be given. In this case Jones deserves as much praise as Al.

Al should never do this kind of thing again; it lowers the efficiency in the whole shop. It was probably not Harrison's intention when he praised Al for a job he had not done. In fact, I think Harrison meant his credit should be passed along to all who participated in doing this job, although he did not say so.

It is every foreman's duty to parcel out compliments to his helpers. No superintendent can run around the shop patting the men on the shoulders for good work. And even if Jones is only partly right in his arguments for credit, he should be given praise for his work. For all such praise the company will gain a lot of good will, and that is worth having.

A E Fristedt
Stockholm-Bromma, Sweden

AL MUST BE a very sensitive sort of a person, if giving to Jones a small morsel of the praise he received from Harrison hurts him so much. Even if Jones only followed instructions, that is worth commendation these days, when, if you happen to sneeze near a work bench, the shop steward makes a case out of it.

Before the war we were doing business with a good size contract shop which had a wonderful system. To start with, the men were good, and, notwithstanding the frequent opportunities to increase the amount of business, the management refused to accept more than the men could handle. Oh, they increased their force, but gradually and mostly through their apprentice system. Unhappily, during the war, pressure was put on them to double, then double again their output, hiring right and left and they became just another subcontractor. However, this is how they kept their force happy, paying regular wages and expecting value for their outlay.

When a good job was done, even if according to drawing, the customer, prompted by the front office if necessary, would, in the hearing of the workmen, make some remark to the foreman about the excellence of something on the tool or its product. He did not need to use a shovel, either, but you could see Jones expand and with a grin, tackle his present job with redoubled ardor.

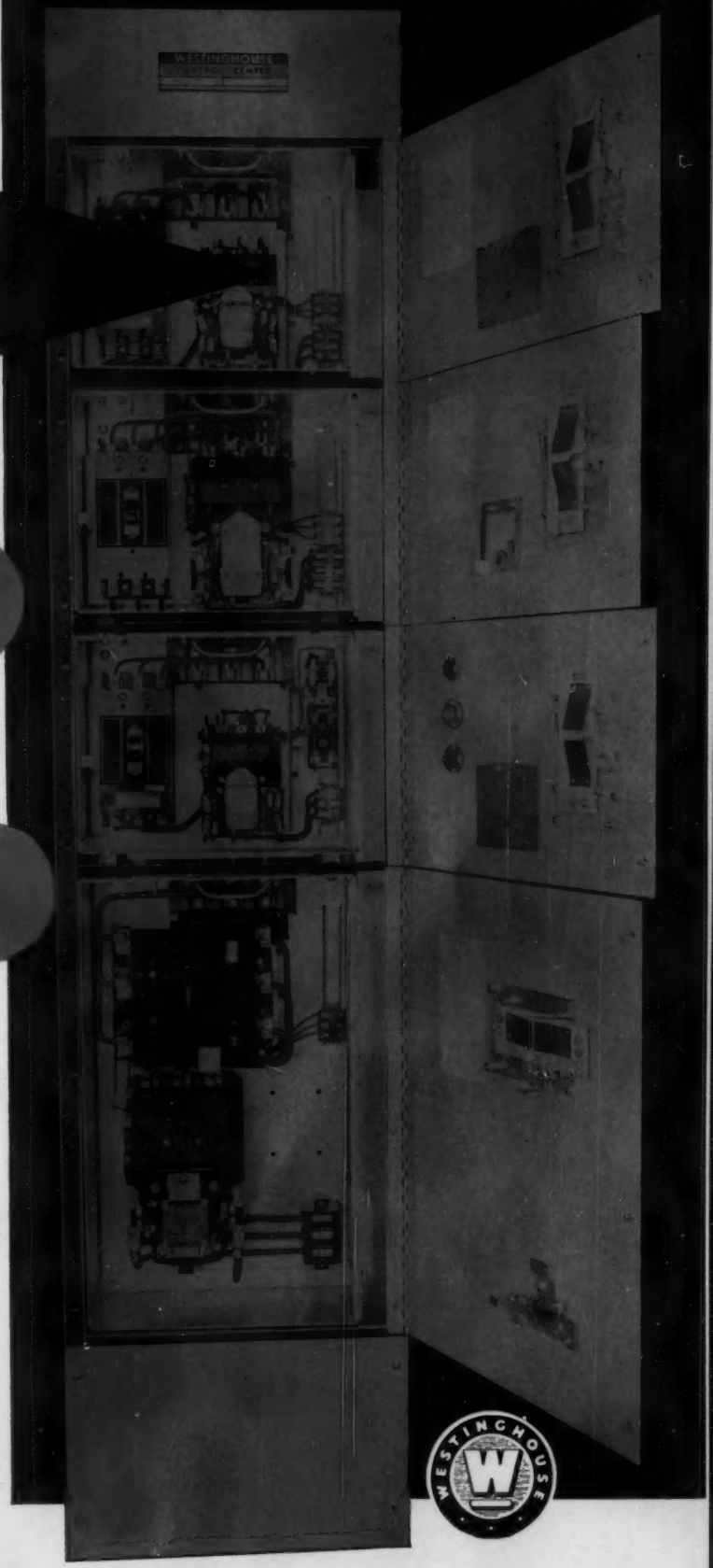
Sometimes, if it was better than a good job, then the foreman would call in the superintendent, and let him praise the work loudly enough so that before long the whole shop knew about it. The foreman did not appear in the conversation, he got his reward in other ways.

Their drafting room was conducted on the same basis, with more restraint, perhaps, for a simple "That's a good job," even if nobody else heard it, would go a long way towards encouraging the designers and draftsmen to do their best, especially when coupled with a liberal financial policy.

If Harrison has come through the ranks, he has surely experienced the disappointments of seeing his best work credited to someone else and

WHY DOES THAT GUY PICK A BIG LATHE TO DO A SMALL JOB WHEN THERE IS A SMALL LATHE RIGHT HERE-ACROSS TH' AISLE-HUH?
FRONT-OFFICE ROUTINE-TH' JOB IS SCHEDULED FOR DEPT 9 AN' THAT'S WHERE IT WILL BE DONE! WE ALL KNOW ITS WRONG BUT WE LIKE IT HERE-DONT ARGUE WITH TH' FRONT BRASS IF YOU WANT TO STAY-I'VE BEEN HERE 10 YEARS-NOT WORKIN-JUST FOLLOWIN' ORDERS!
DEPT 8
DEPT 9
-ALL FOR HARMONY-

HEAVYWEIGHT SHEDS 280 POUNDS!



ANOTHER WESTINGHOUSE "FIRST"— NEW CONTROL CENTER STRUCTURE MADE OF REYNOLDS ALUMINUM

Always a pioneer in developing the latest in electrical apparatus, Westinghouse again leads the way with this all-aluminum control center structure. Using Reynolds Aluminum, Westinghouse reduced the enclosure weight from 430 pounds to slightly over 150 pounds.

Aluminum is used throughout—from outer cabinet, sub-base and screen baffles to vertical and horizontal aluminum bus bars.

Aluminum offers a more attractive, clean-cut appearance—important in applications where cleanliness and neatness are necessary. Aluminum offers the corrosive resistant qualities so necessary in chemical plants. In the words of Westinghouse "—aluminum opens new fields of greater performance in control center applications."

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REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

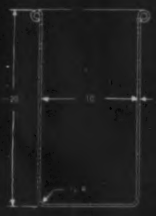
MORE

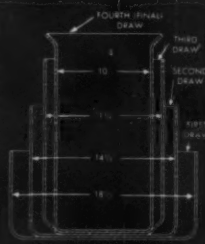
KNOWING HOW
...often means Savings and a Better Product

...this handbook "ALUMINUM FORMING" gives complete information on aluminum techniques

Everyone who works with aluminum should have this 148 page handbook from the Reynolds library of technical handbooks. "Aluminum Forming" was published so that product designers and plant supervisors could have, in a single volume, complete information on the proper techniques for bending, forming and drawing aluminum. Design and fabricating practices with aluminum are not always exactly like those for other metals. In some cases modifications or even special procedures may be required. This handbook fully explains all these procedures and includes more than two hundred and thirty drawings and photographs, twenty-two tables and thirty-two formulas.

Single copies of the valuable Forming handbook are free when requested on business letterhead (otherwise the price is $1.00). A complete index of Reynolds technical literature is also available. *Reynolds Metals Company, P.O. Box 1800-JJ, Louisville 1, Kentucky.*





These are typical of the many illustrations in "Aluminum Forming": Left, drawn shell of 3003-O aluminum. Right, various stages of drawing necessary to produce shell. (Book includes formula for estimating number of draws.)

REYNOLDS ALUMINUM

MODERN DESIGN HAS ALUMINUM IN MIND

he must realize that the lack of a few words of praise at the right time may seriously affect the morale, not only of the man directly interested, but of the whole department. Of course, we all know of foremen who consider such aspects of supervision as a reflection on their capabilities, but their number is gradually diminishing. Soon all supervisors will give as much thought to personal relations as to the other parts of their jobs.

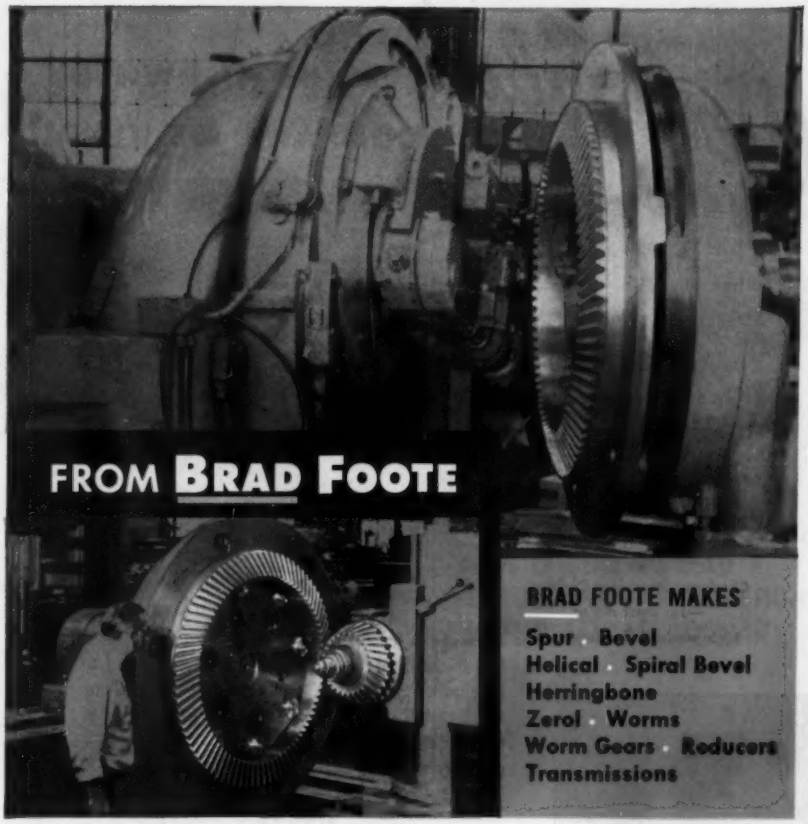
P P Fenaux
Lynn, Mass

ED HAS A lot to learn about human nature. If Jones has any reason to feel that Ed took credit for the work he, Jones, did, he has a right to feel sore. Even if Jones did go to Ed for help, Jones was the one who did the actual works; his workmanship produced it. And isn't it part of a foreman's job to help his men when they get stuck?

Of course it is quite possible that Jones would have forgotten to tell anyone of the help Ed gave him, had Harrison talked to Jones about the job. But regardless of the assistance he received, he did the actual work and, if it was good, he should have had credit for it. We are all more or less thin-skinned when we see, or think we see, someone else getting credit for what we have done. When you do a good job, even if some one else did have a few suggestions that helped, you not only like to get credit for it, but you particularly dislike to think some one else is getting patted on the back because of it.

One very successful shop manager I knew was Ed's opposite. He went overboard in seeing that his men got credit for what they did. It was very good policy on his part. For when he got his job the men resented it because he was a brother-in-law of the big boss, with few mechanical qualifications for the job. He was bright enough, however, not to try and pose as a first-class mechanic. He was very human in all his dealings with the men and he went out of his way to give every man credit for his work whenever opportunity offered. Whenever I visited the shop he took pains to have any man who had done a specially good job, show it to me and tell me all about it. He'd ask Bill or Jack to show me the job he had done last week or whenever, and assure me that Bill or Jack was one of the best men he had; that he wouldn't know how to get along without them. Perhaps he put it on a bit stronger than necessary, but every man in the shop would do anything they could for him. They made his job safe for him.

Some top management used to



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think that when they hired a foreman he was to have all the brains in the shop. So a foreman was perhaps, to be excused for trying to make the big boss think he originated all the bright ideas. The Suggestion Box idea helped change this. Management now knows that the foreman's job is to keep work moving more than to have all the bright ideas. Ed had better give too much credit than not enough.

Fred H Colvin
Point Pleasant, NJ

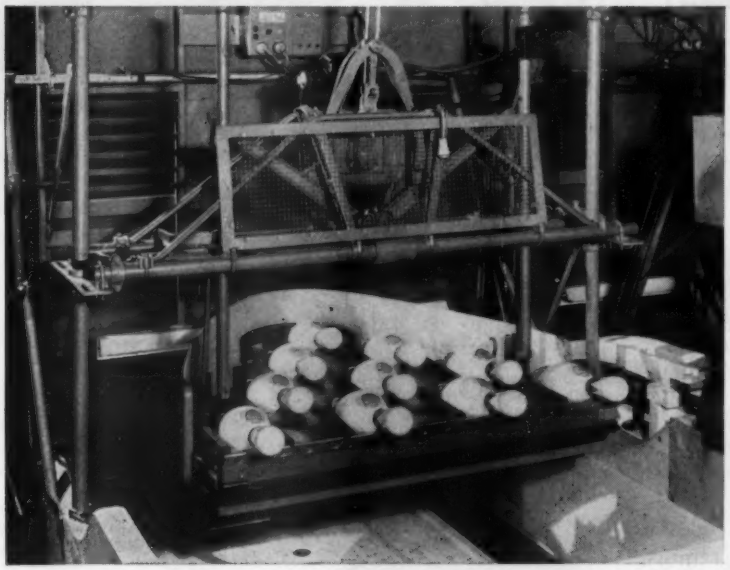
WHEN THE FOREMAN is complimented by the supervisor for a particular job or jobs he should never hesitate to pass along a word of praise to the man who worked on the job. Few foremen realize the need we all have for appreciation of our work. A judicious word of praise is very easy to bestow and produces results out of all proportion to the effort required to bestow it.

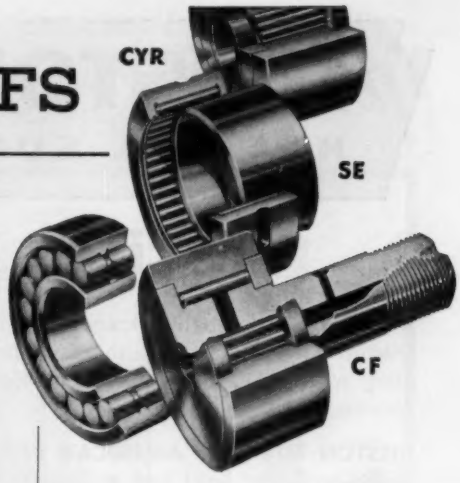
We all need recognition of our individuality and this is one way to accord it. No one, even if they are the quiet, unassuming type, wants to be taken for granted. The plant is large and has a personality of its own in the field of industry. Anything that gives the worker a feeling of participation in, and identification with, the big organization raises his self-esteem and reflects back on himself some of the prestige of the concern itself. A man is entitled to know why the thing he is doing is important, where it enters into the general scheme of things, and how it affects the product that reaches the ultimate consumer. He can be made to see that the responsibility is his, and so attain a sort of feeling of proprietorship of the machine and the job which is then literally his.

One of the things that keeps men

"Well! — What's so unusual about a little game during my lunch hour?"

McGILL BEARING BRIEFS





CAMROL CF bearings ADD TO SAFETY of 22,000 Brunswick-Balke-Collender semi-automatic pinsetters now in use

When the pinboys "set 'em up in the other alley" a McGill CAMROL Cam Follower helps them do the job without danger to themselves or damage to the pin-setting machine.

Known as the B-10 Semi-Automatic Pinsetter, this machine is a product of The Brunswick-Balke-Collender Company and is in use on 22,000 individual bowling lanes throughout the world.

In these machines the CAMROL CF bearing is used in the safety latch mechanism to lock the cam action and prevent the machine from recycling during pin setting. Used by the company for 4 years, the CAMROL bearing has given no trouble despite the literally millions of cycles these 22,000 machines have been operated.

CAMROL Cam Follower bearings utilize a full complement of small diameter followers with outer race and integral stud and flange custom heat treated for the ultimate in radial and shock load capacity.

Precision tolerances on all grinding surfaces with simplified lubrication minimizes internal wear and increases bearing life. Both starting and running friction are reduced to a minimum.

McGill designed and built the first Cam Follower and used 20 years of experience with thousands of applications to perfect the right Cam Follower for any cam action application.

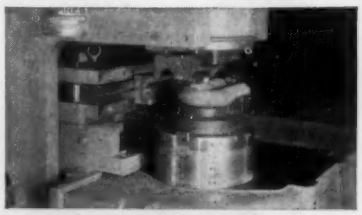
BEARING SELECTION GUIDE

A revised 140 page Bearing Selection Guide, complete with 30 pages of vital engineering data, has been released by the McGill Manufacturing Co. Ask for Catalog No. 52.

CAMROL CF BEARING USED from BEGINNING of PRODUCTION by SCHIELD-BANTAM COMPANY

More than 5,500 cranes and excavators built by Schield Bantam since 1945 use CAMROL CF Bearings in SHIFTING COLLAR vertical swing shafts and drum clutch applications. With maintenance negligible and performance excellent the manufacturer asserts, "Using CAMROL CF Bearings offers an overall price advantage and insures maximum product quality."

PINES PRESSURE DIE HOLDER PUTS up to 18,000 POUND LOAD on CAMROL CYR BEARING



Pines Engineering Co., Inc., has used the CAMROL CYR Bearing for 6 years in tube bending machines and has never had a failure. The bearing takes the full bending moment in Pines pressure die holders that bend extra heavy pipe in sizes ranging from ¾" to 4" without scratching the tubing.

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going and driving themselves all their lives is the inherent need we all have for recognition of our individuality.

We will go to great lengths to establish ourselves as being different from the common herd. It is this that makes us feel hurt when a supervisor fails to recognize our abilities. It is for this reason that we resist all attempts to regiment us or to make us parts of the industrial machine. It is this desire that makes us want to talk about ourselves so that we have little time or interest to listen to others. Knowledge of this desire for recognition provides the foreman with a valuable tool to assist him in leading and getting cooperation from the men he works with.

Clifford Molloy
Bronx, NY

•

SLIDE-RULE FOREMEN

Does the engineer, appointed shop foreman, have a strike against him in the men's eyes? Will they resent the fact that he hasn't worked up from the ranks? Can he make a good foreman?

PROVIDING this new "slide-rule foreman" is endowed with the necessary amount of good judgment and sound, common sense, I see no reason why he shouldn't be able to do justice to his job. However, when I come to think about it, there seems to be a six-square nut loose somewhere because I've a notion that the trained engineer's place is not at the head of a headache factory (a foreman's job) but one of the spokes in the wheel of engineering planning. Doesn't he belong in the engineering department where he can put his training to better use in planning and design? I cannot help but think that for him to take on a foreman's

"The Boss said all the suggestions suggested that he get rid of the Suggestion Box."

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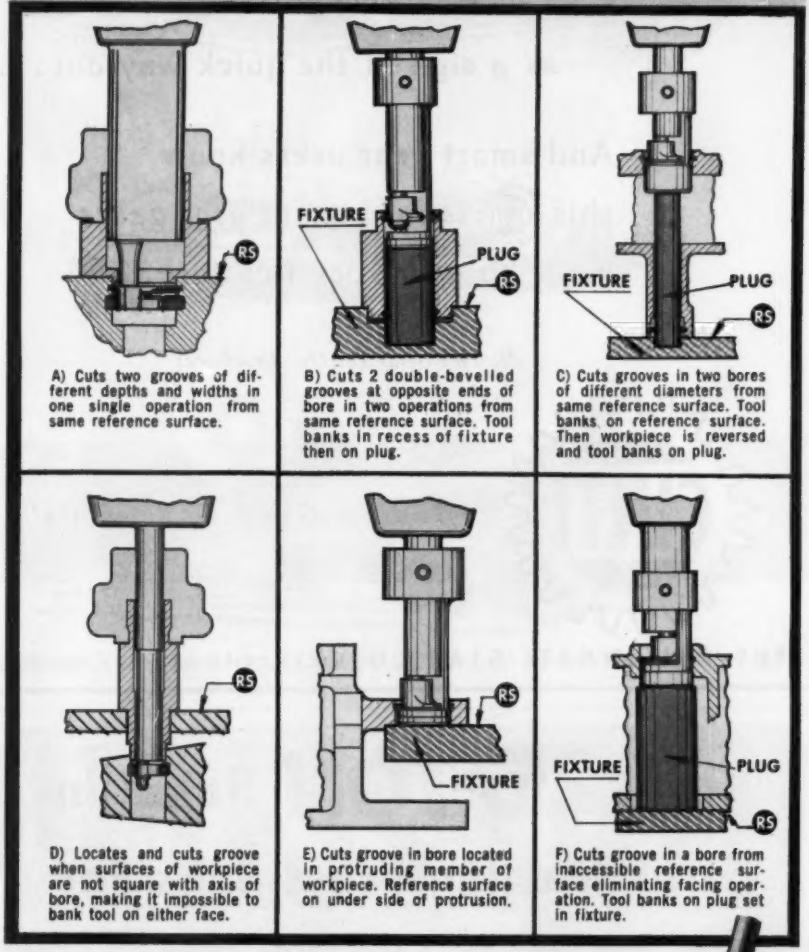

A) Cuts two grooves of different depths and widths in one single operation from same reference surface.

B) Cuts 2 double-bevelled grooves at opposite ends of bore in two operations from same reference surface. Tool banks in recess of fixture then on plug.

C) Cuts grooves in two bores of different diameters from same reference surface. Tool banks on reference surface. Then workpiece is reversed and tool banks on plug.

D) Locates and cuts groove when surfaces of workpiece are not square with axis of bore, making it impossible to bank tool on either face.

E) Cuts groove in bore located in protruding member of workpiece. Reference surface on under side of protrusion.

F) Cuts groove in a bore from inaccessible reference surface eliminating facing operation. Tool banks on plug set in fixture.

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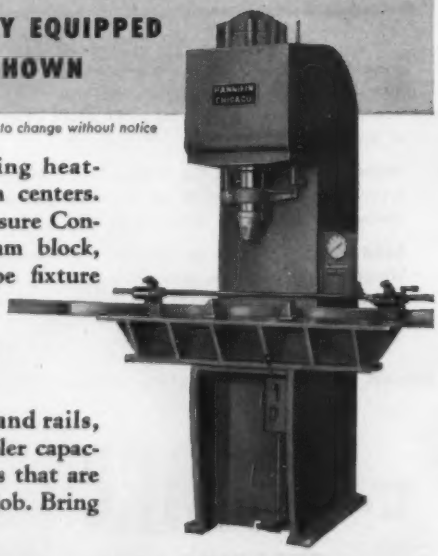

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job may be beneficial for a time, but in the long run he will lose out financially and come out in the end with a frustrated mind as well.

While considerable amount of technical training would be of great value to a foreman, (providing he didn't go overboard in showing it off as I've seen some fellows do) let us not lose sight of the real value of heard-earned experience as a necessary asset to good supervision. The paramount question in my mind right now is: Does this Phi Beta Kappa have the know-how to go along with his slide rule and wonder books? He may have been through all the technical fundamentals and, if given plenty of time to browse through the formulatic depth charges, will be able to do the necessary calculating to come up with an answer, but does he know how to deal with the multifarious complexities involved with human problems, with which a foreman is beset? Does this high-powered foreman possess the fortitude to brush his slipstick to one side and tell one of his men to do a certain thing a certain way, that he knows, from his past experience, will do the trick?

The real danger in a man of this caliber handling a foreman's job is that he will dabble too much in theory—dwell too much on pi and ignore the nourishment therein,—sound, common sense so evident in the rugged foreman who directs his men from a foundation of painful experience.

I wonder if it wouldn't be a good idea for some authorized agency to ascertain what percentage of our shop foremen are graduate engineers. It is my guess that the number would be very small in comparison with those who have come up from the ranks—those with a grammar-school education who have served their time in apprenticeship,

"A lesson like this certainly teaches a fellow. This is my seventh lesson."

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and gathered their experience as journeymen.

If we could find a man who is a graduate engineer, and who has had a number of years at practical work, we would have a good combination —that is if you could induce him to take on a job of shouldering the troubles of a shop. It takes guts to assume charge over a shop, and it requires a lot of experience to back it up. The shop foreman has to be a combination machinist, mind reader, psychologist, and horse doctor—the latter requirement being necessary to handle the many unreasonable jackasses he has to deal with throughout the harrowing day. The foreman is a go-between, perched as he is in the middle of two fires—the hell-raising superintendent and the belly-aching men under him. I doubt very much if the man with his head chock full of math and theoretical know-how could happily weather the hurricanes—Mary, Molly, and Marilyns which screech through his baffled brains during a period of eight hours in the shop, and the rewardless ones at home.

Robert Roundbottom
Laguna Beach, Calif

STRANGE AS IT MAY SEEM, engineers can make good foremen. They are just ordinary people, even if many foremen think of them as a bunch of highbrows and in a class by themselves. It is true that engineers have a desire to be something more than just a foreman. This drive-motive, perhaps, makes them a bit different from the general run of shop foremen who have seemingly reached the goal of their ambition and expect no promotion until the boss dies.

Engineers often start at the shop level and fight their way up. They have their eyes on high management positions. Maybe this is why so many of them who do start as

cluded his own—is only obtained through cooperation.

shop foremen cause consternation among other foremen.

As engineers have a basic training which is not usually found in the shop, they apply a different approach to the problems which confront them. They not only call upon their practical experience, but also lean upon the book learning which they acquired at college. The more recent the graduate, the more "booky" the engineer is. However, today in colleges and universities which are considered tops in engineering, the old method of not being practical but of applying all theory has changed into a better and more useful state. We now have engineers who not only know the theory of metals, but also know its workabilities and how to actually fabricate pieces. This is the combination of trade experience and theory training. Our cooperative educational system is one of the biggest assets in having engineers trained to enter manufacturing at various levels.

The natural tendency toward jealousy causes much of our clash between school or college-trained foremen and shop-trained men. Personalities also play a very large part. It is very true that engineers who have no shop training, and many still do not, are those who cause disruption in production through errors of judgment. But if we were to stop to analyze many of these engineers and compare them in quality with shop men, we would undoubtedly find shop workers who lack the same basic understanding of problems.

Again it is our human nature and the difference in mental astuteness that finally makes the difference between mediocre and superior people. Foremen who have had engineering training are often more critical of engineering work that comes to the shop than a shop-trained man, and know what is the matter and how to fix it. This only aids the company in properly getting its engineering on a sound footing. Naturally, cooperation is always needed and shop foremen can work just as closely with the engineering department as they desire, and personalities will allow.

It is really too bad sometimes to think that many a company does not properly grow because of the plant's ill-feeling toward the engineers. It is a sad state, but it seems to exist all too frequently. Much of the blame is with the engineers. Many of them cannot "talk shop." Many unfortunately do not feel that they should lower themselves to do so. This is really a tragic blunder on the engineer's part. For success—in-

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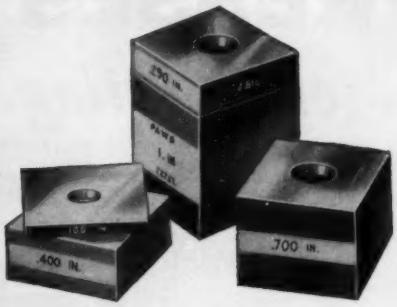

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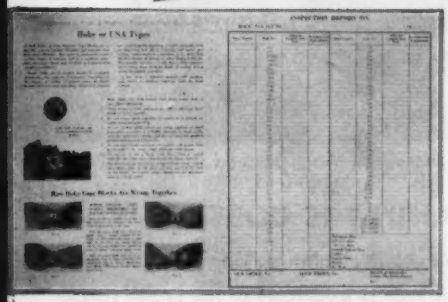

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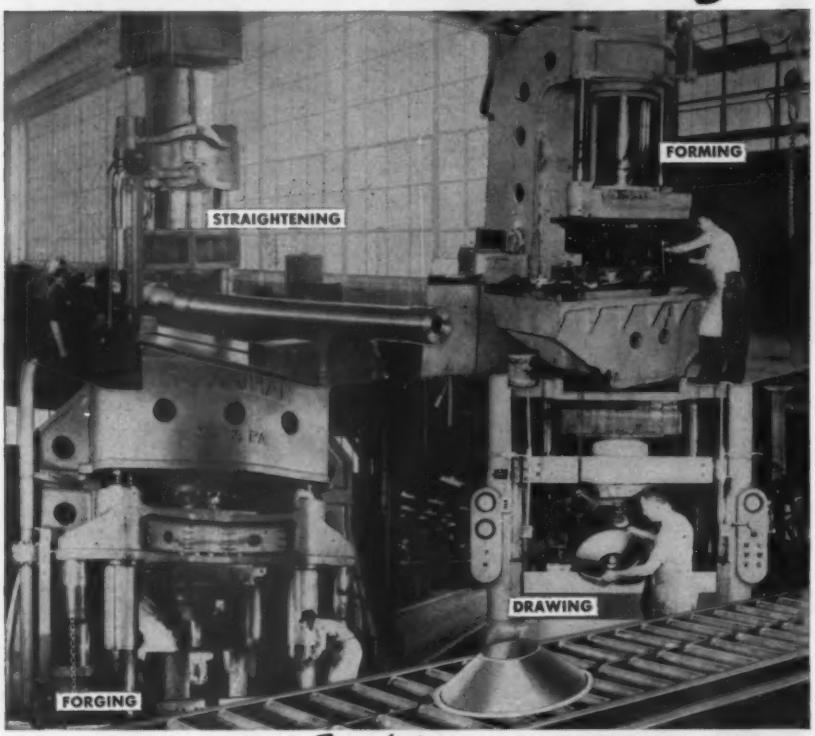

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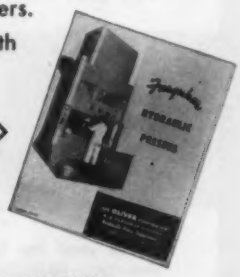

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cluding his own—is only obtained through cooperation.

Never condemn an engineer who has been made shop foreman. Rather, find out about his background and then work with him. He can help all foremen if they will let him. True enough there always are some young engineers who are "high and mighty," but also there are some foremen who have no particular schooling and yet they, too, are high and mighty. Whether men are engineers, doctors, lawyers, foremen or just workmen—we find all types of personalities among them. Fortunately no one group is made up of all one kind.

Charles D Townsend
West Hartford, Conn

WHEN WE TRY to evaluate the relative merits of the modern-trained executive and the one who pulled himself up by his boot-straps—the chap who served his time after being forced to leave school through circumstances beyond his control, traveled around the country gaining experience and knowledge and finally winding up as an executive—we have to stand off at a distance to get a better perspective of what's what.

We must not lose sight of the splendid equipment we have in this country to train one in his chosen work. The educational values given out in this enlightened day by the technical schools are inestimable. They are not confined to the narrow fields of abstract theory once looked upon as mere tripe by the practical man, but application to the needs of industry seem to be the watchword. Technical schools and

"Well, then, where are the waste rags?"

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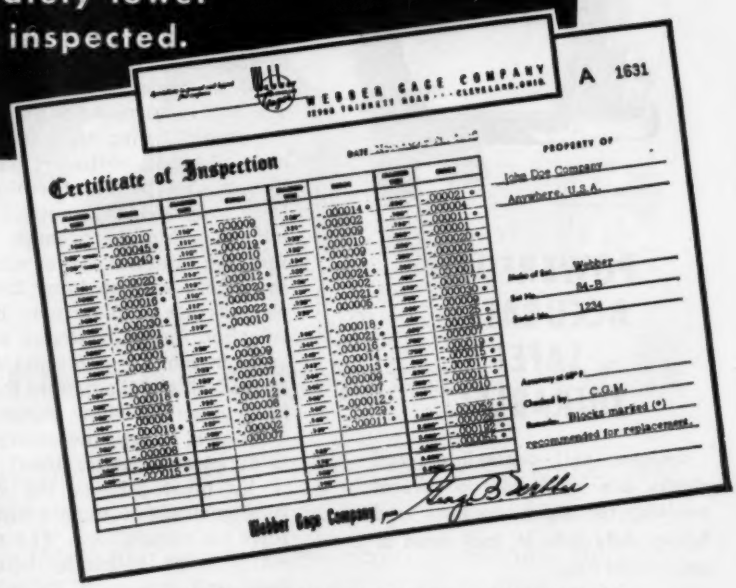

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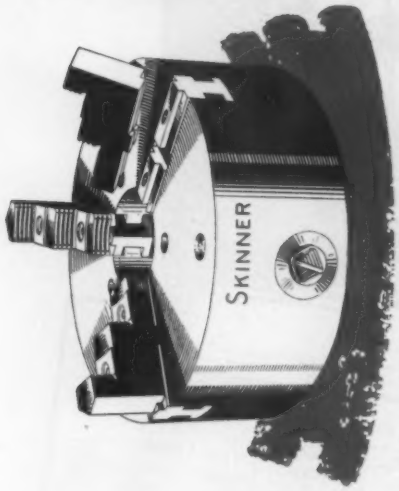

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colleges are now equipped to prepare their students with the theoretical fundamentals as well as the practical application on the job.

A man doesn't necessarily need to get his hands dirty in order to acquire a working acquaintance with the details of a trade. The person who has the will to apply himself diligently can acquire more information pertaining to the machinist or toolmaking trade today in a tenth of the time he would get it were he to strive to acquire it by hand-to-mouth stages as we were accustomed to do in the days of belts and countershafts.

So Ed has his doubts about the fellow who uses a slide rule on the job. Ed seems to have suspicions about anyone who hasn't worked his way through grime and grease in order to acquire knowledge of his job. We used to pride ourselves, Eddie, in our ability to make a quick change by expertly flipping a belt. Things have changed, oldtimer; we press a button and presto, there you are! It is very evident that Ed is prejudiced, evidently because the new foreman didn't arrive at where he is in the old way of doing things. The chances are that he may have justification for his contempt by having come in contact with some who were in the habit of displaying their book-knowledge for show purposes only.

What is usually necessary for one to be an efficient foreman? Certainly he must possess the necessary fundamentals to enable him to perform his calculations. Why not materially assist in this by being up-to-date and use such helps as slide rules?

In contrast to the thoroughly-trained person is the hard-boiled foreman who struggled throughout his years of apprenticeship, barnstormed his way around the country to put what he had learned into practice and to augment that learning with additional experience and skill. These years of practical research which meant lugging a toolbox around from shop to shop—most likely relieving himself of such a heavy incumberance and carrying the most essential tools in his pockets—constituted a post-graduate course in his trade. He ascended the ladder of success stage by stage, and sound reasoning, combined with positive judgment, enabled him to face any job that confronted him. With such preparation he could, although pretty scant on basic fundamental knowledge of math and science, master any supervisory problem that happened to come his way. Here we have a fellow who spends his spare time at home doing his very best to catch up on what he lacked in acquiring in his younger days. One thing is certain, he is able to get along with his men and is so constituted that he takes no guff from any of them. He's sure of himself at all times.

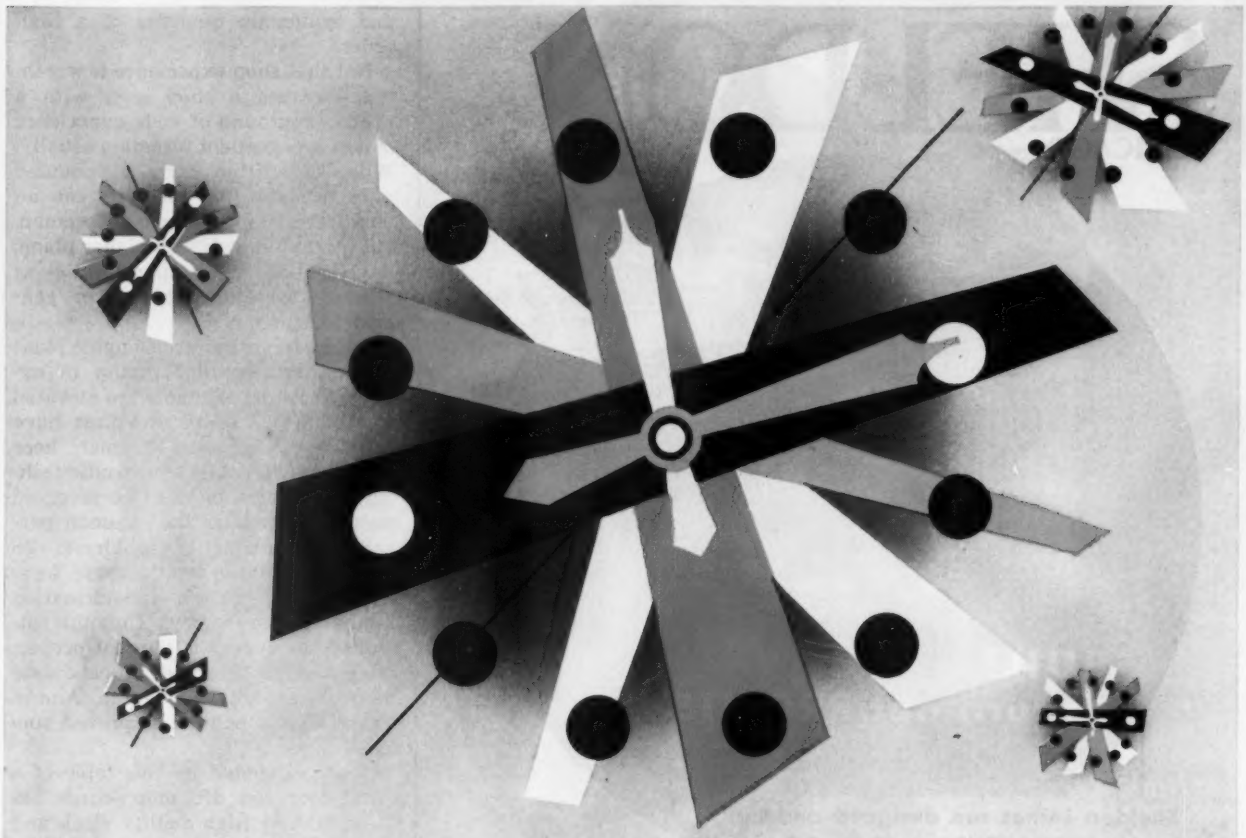
During my days I have come across one foreman who even thought of himself as an engineer, let alone tried to act like one. It may be that I am talking through my hat to say that one with engineering training should not confine himself to the level of shop foremanship when there are so many avenues of opportunity around wherein he could handle a better job—where the sky would be the limit in chances for advancement into the higher bracket of engineering effort.

I want to caution Ed on one thing: Don't think that because one has a slide rule he is a well-trained engineer. The slide rule is a symbol of facility, in addition to being a pretty handy gadget for arriving at a solution in a streamlined fashion. I knew of a chap who posed as the great I Am. Occasionally he would pull out his rule and slide it back and forth several times, then silp it back in the drawer where it reposed until an occasion warranted its resurrection to put on a little spurt of mathematical facility.

Albert Hodges
Victoria BC

IN PRESENT-DAY machine and tool and die shops, it has been my experience that the technical problems encountered are such that mechanical engineering experience supplemented by shop experience expedites work. Different materials, complex machine building, new machining methods, more complex dies built to closer tolerances, all tend to raise the standards set for supervisory personnel. Not to forget labor relations which demand understanding

"Want to hear something crazy - - - the boss says that we'll all be replaced by robots in ten years."



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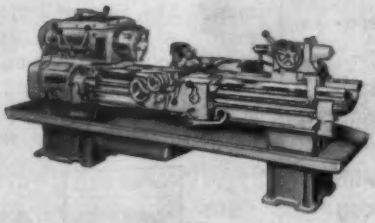
We have all been given an equal number of hours in every day to use in any way we see fit. We can kill time or take advantage of it. It can be an inexorable taskmaster or a valuable ally. We'd like you to know about a machine that can help you make the most of the costly hours between punch-in and punch-out. It's an Axelson lathe—one of the really fine machine tools built in America today. May we take the time to tell you about it?



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and leadership qualities of a high order.

Not that shop experience is worthless, because a shop man with a good background of wide experience makes an excellent foreman, usually. What is written here is intended only to show that not only can an engineer make an excellent foreman, but that often he is on a higher plane, having additional responsibilities as well as those of foreman or general foreman.

At the largest aircraft engine plant in Connecticut all foreman in experimental departments are elevated to "engineer" status and thus have "engineer" badges. Foremen here must have the ability to handle technical problems, often of an involved nature, as well as the common personnel labor-relation problems. To handle the latter work, these foremen are given an indoctrination course by the factory. Thus the rating of "engineer" is thought proper, even though the foreman-candidate may not even have a degree. And in practice, this policy has proved successful.

I am reminded by this topic of a local tool and die shop which has been making high quality clock and watch movement dies (gear) for about six years. This small industrial project was started by a graduate electrical engineer of many years experience in both mechanical and electrical lines of work, who handled procuring of this type of tool for a clock company, which of course meant plenty of work for the shop. Obviously the project was assured of success . The engineer designed the tools, hired and fired help, set wage rates, etc, for his shop and otherwise ran it through a "leadman." The title of "slide-rule foreman" is singularly apt for this particular individual as he had the habit of demonstrating his ability with the slide rule by even using it to calculate possible weekly wage

"We're supposed to take up our grievances with the Shop Steward, and HE'S the one I've got the beef against!"

Some typical parts produced from HAYNES *alloys*

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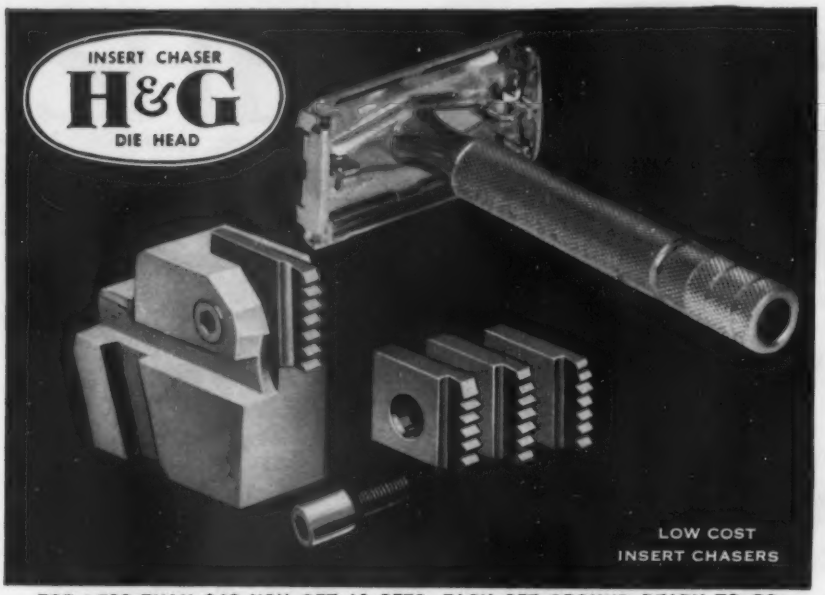

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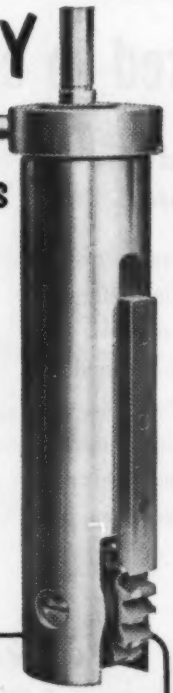

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(based on a given hourly rate) for the prospective new employee. And he is doing very well with his little shop which has employed up to ten toolmakers.

There is another instance in a plastic shop of a chief engineer running the machine shop through a foreman which has worked out well. He works in the shop constantly, directing work on the design and building of plastic dies (all types of molding).

Edward Diskavich
Torrington, Conn

WHAT IS MY IDEA of an engineer's ability as a shop foreman? I might as well be asked what my idea is of a psychiatrist acting as a referee in a championship bout. The efficiency of the individual depends upon his ability to forget the theory most of the time and perform in a natural way in order to obtain the best results.

I would like it understood that I do not look down upon the theory-trained person who graduated from an accredited college. I have the highest respect for the graduate ME who ferrets out the why's and wherefore's by way of theoretical analysis, providing he is capable of doing this while exercising sound common sense. The definition of education as far as it is applicable to an engineer is "learning to use your head most effectively by going out into the practical world and getting it bumped around a bit."

As a foreman, does he have to make a study of conditions he is faced with, exercising his ability to dabble with intricate formulas, or can he see his problems at a glance and come out with a healthy solution? The psychiatrist hasn't got time to lay his scrappers on a couch or the chances are that he would run into a bolo swing and find himself

"Machinery certainly has a way with him."

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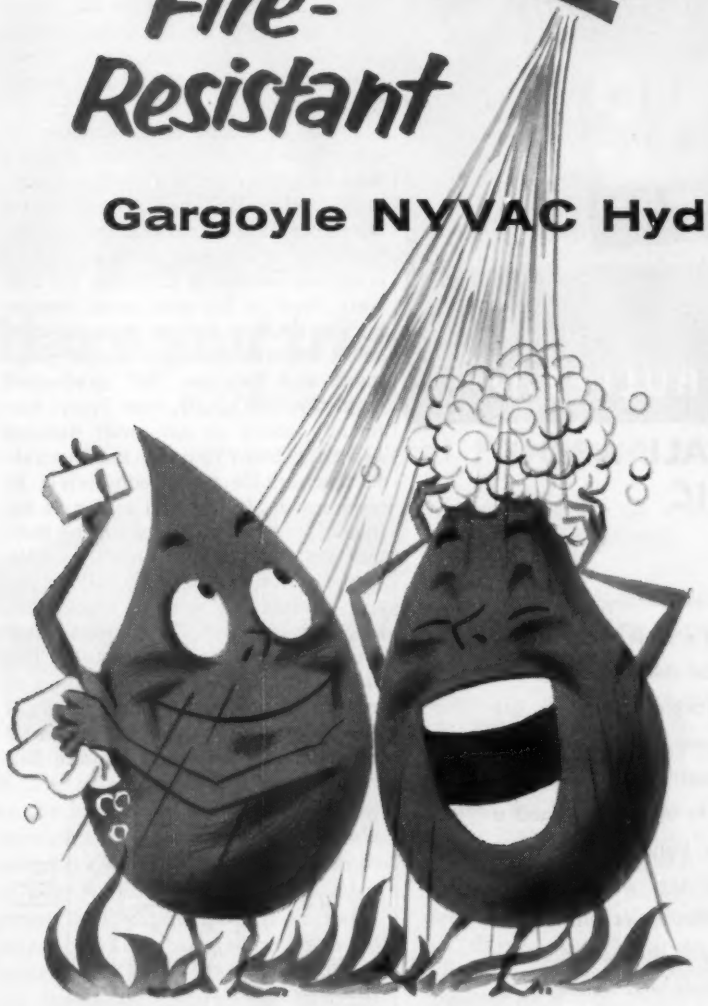
real fire prevention
for your plant . . .

New Fire-Resistant

Gargoyle NYVAC Hydraulic Fluids



Do you use hydraulic machines near furnaces, molten metal pots, red-hot steel slabs or other sources of ignition? If so, with oil in service, you have the possibility of a fire that could badly cripple your production.

New fire-resistant Gargoyle Nyvac hydraulic fluids will prevent such fires.

There are two types of these fluids—a straight synthetic fluid and a synthetic water base fluid. Both have been thoroughly proved in the field. Your particular machines and operations will dictate which product is best for your plant.

Although synthetic in composition, these new products are still designed to keep your machines running on full production schedules with low maintenance costs. They are backed by Socony Mobil's complete engineering service.

The new Nyvac fluids round out Socony Mobil's complete line of top-quality hydraulic fluids—all available from a single source of supply. Call your Socony Mobil man for complete details.

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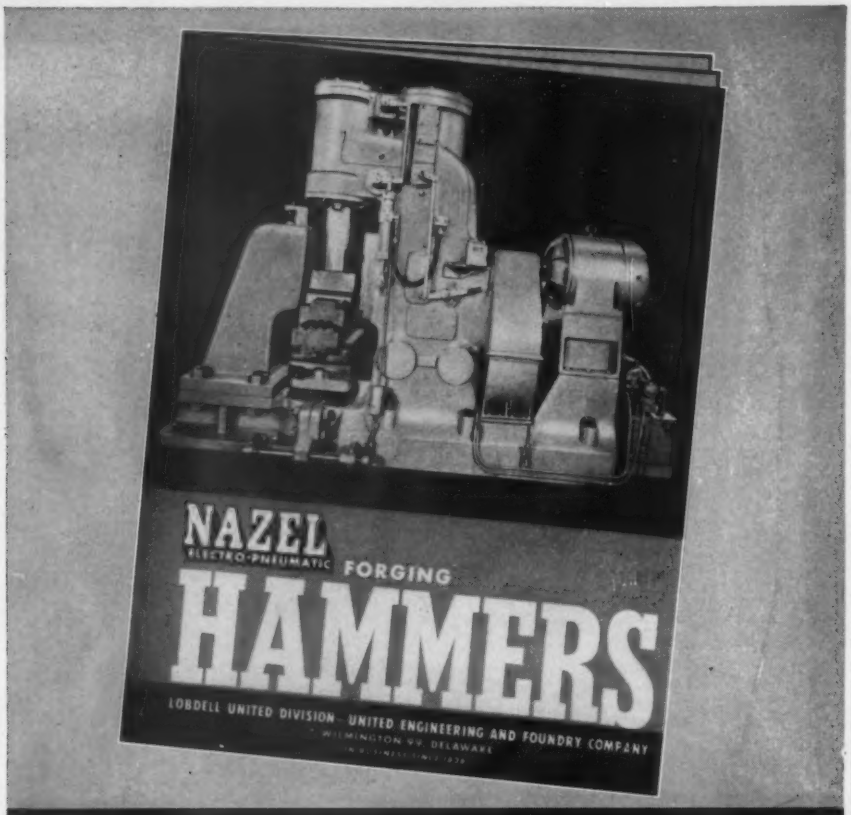

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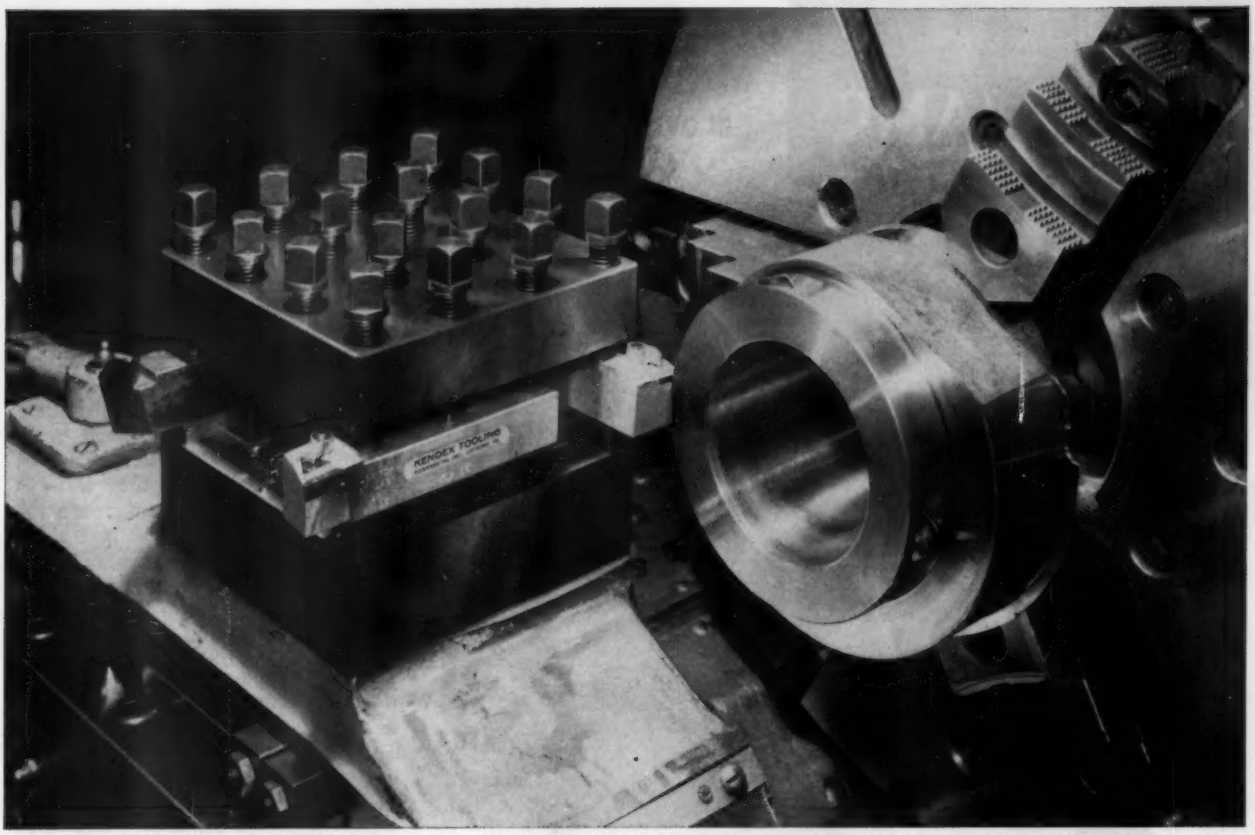
1836 WILMINGTON 99, DELAWARE 1955

counted out after he comes to. The engineer, likewise, hasn't the time to go into the mysteries of figures while he is loaded down with the usual shop problems — he's got to come up with an answer right now. His answer should be based on his potential effectiveness based on years of practical experience wherein problems of a similar nature have come before him.

The person who has the theoretical foundation at his disposal but who hasn't soiled his hands in practical work is no person to handle a foremanship position because, for one thing, the men to be directed by him are mostly practical men who have not had the advantages of formal education. These men will resent having a slide-rule crackpot trying to tell them what to do. They don't want to be involved in intricate calculations of which they know nothing. They want to get something done.

I like to think of a foreman as being like Bill, an old friend of mine who had charge of a shop doing general repairs. Bill was a hard-boiled character who managed to get the work out of his men because he had complete control at all times. He was well liked by his men, even though he was gruff and terse, because they could depend upon his sound judgment and fairness. Bill graduated from the fifth grade, cum lousy, materially aided in his swift descent down the front steps by his frustrated teacher. He failed completely in his English studies and as far as his mastery of arithmetic, well, the poor guy just couldn't do anything with long division. Bill left the halls of ivy and hooked up with a blacksmith who put him through a pretty stiff course in working of metals. The blacksmith was imbibing a glass of fresh Bock one evening and managed to ooze a promise from an owner of the local machine shop to take Bill

"They just don't make steel like they used to."



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K21 solves problem of troublesome operation

The photograph above shows an operation which involved turning two finished diameters on SAE 1080 steel casting with a BT16G insert in a Kendex* KTAR16 holder, using a new 40 HP Warner & Swasey turret lathe. Both cuts were made with the same tool. The 8″ diameter was rough turned at 236 SFM, 5/16″ depth, and finished at 324 SFM, 1/16″ depth, length of cut 2″, feed 0.0167″. The second diameter was finished at 6″, 2″ wide cut, interrupted by 3 diagonal 5/8″ holes. One cutting edge turned 6 pieces before indexing, while the best competitive carbide *was unable to turn even one piece* successfully because it chipped. K21 has been standardized for this troublesome operation.

Another test showed K21 increased production 33% per index over nearest comparable, competitive grade on a finish turn at 705 SFM, 0.010″ feed, and 0.005″ depth, machining laminated stator cores.

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on as an apprentice. For fifteen years he traveled around the country gathering experience and know-how. Finally he returned to his old shop and took over. Three of Bill's sons graduated as engineers and worked under him for a couple of years each, so as to be better prepared to handle the work they would eventually undertake. Bill realized the handicap he worked under in not completing his education, and he also knew that his sons wouldn't get anywhere without the time they spent in his shop.

Now the question comes up: "Wouldn't they make good foremen?" Yes, they would, with the training they had, but they were of higher caliber than to take on a job of shop foremen. If one is trained for engineering work he should follow just that and not limit himself to being just a shop foreman. To take on such a job would only be a waste of time.

Harry McTavish
Medicine Hat, Alberta

YES, why not make foremen out of engineers, but if so, they must be engineers who, besides their technical education must also have had practical shop experience. Theoretical training alone does not qualify a man to be a foreman in any machine building industry.

An engineer not knowing the first thing about shop operations should never make an application to be a foreman, at least not in a machine shop. The guys won't respect him, and he would probably give entirely wrong orders. As assistant foremen he might perhaps do, if the foreman himself is an experienced shop man. In that case the two would constitute a very useful team. Technical knowledge and

"Most of it is for your deductions. That little coupon-looking thing on the far end is your check."

practical experience is a very effective combination, even if the young engineer can't tell a socket wrench from a pipe wrench. Of course, this is going to extremes, but I suppose Ed is only illustrating a principle when he compares the engineer's practical knowledge of tools with his own.

A time-study man I met at one place had a master's degree in engineering, but the value of his time-taking was questionable. On one occasion he was ordered to check the time when turning small shafts for cream separators. The lathe hand, who was a smart fellow, asked the engineer what speed and feed to use. The engineer, who had no idea about these important points, told the man to use the speed and feed he knew were suitable. So the guy ran the lathe rather fast, but put on a very fine feed. He also took very shallow cuts. The engineer registered the time, unaware of the fact that he was being cheated by the guy both on the feed and depth of cut. The engineer didn't know that it takes much more time to grind down the surplus material to fine stuff, than it takes to use a coarse feed and remove it by thick chips. The man also took three cuts instead of two. The result was that the man got 25 cents a piece when he should have had only 12 cents. It would be easy to cite hundreds of valuable tips like that, which only the practical man knows anything about.

A real asset to any company is the tradesman who is also technically educated. So I suggest that the engineer in question be sent to an evening course in shop practice, and Ed and Al should take an evening course in engineering or perhaps a correspondence course would do as

"There's one good thing about owning a small job shop. . . . There must be!"

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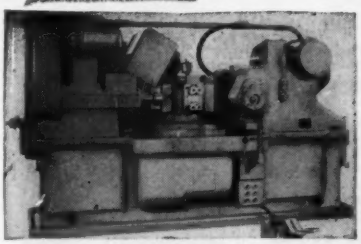

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well. This will greatly improve everyone's capacity.

Instead of looking for trouble and difficulties Ed should make himself really acquainted with the engineers upstairs and exchange views with them to improve the product and tools. This is only common sense applied.

An engineer with no shop experience should never be given charge of things he doesn't know anything about, nor should a foreman without an engineering education be accepted for an engineer's duties. Both are necessary in any shop, but they ought not to swap positions.

Working in the shop between school terms is very useful for any young man, but probably not sufficient for a foremanship, but, as Al says, each man is a different case and should be judged individually. The foreman and engineer should supplement each other—not fight. To obtain best results, school and shop-work should be combined, as both theory and practical know-how are necessary in any machine shop production.

A E Fristedt
Stockholm-Bromma, Sweden

New Books...

KEEPING UP TO DATE ON SOCIAL SECURITY AND WORKMEN'S COMPENSATION—*Insurance Management Series No. 106. Published by the American Management Association, 330 W 42nd St, New York 36. 32 pages, 6 x 9 in. Price, $1.75, non-members; $1.00, members.*

This booklet analyzes the effect of social security payments on retirement plans, and discusses various aspects of workmen's compensation insurance, such as evaluation of various rating plans and standards for self-insurance.

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COMPANY EXPERIENCE WITH MAJOR MEDICAL EXPENSE AND PRODUCTS-LIABILITY INSURANCE—*Insurance Management Series No. 105. Published by the American Management Association, 330 W 42nd St, New York 36. 44 pages, 6 x 9 in. Price, $1.75, non-members; $1.00, members.*

Experience of several companies with this relatively new kind of insurance—major medical, or "catastrophe" insurance—may help others

Talking About Die Sets

WITH

PHIL MARSILIUS

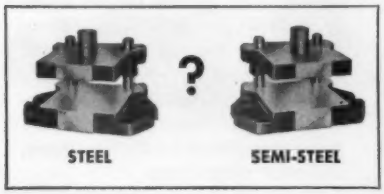
Vice-President
The Producto Machine Co.

Steel vs. Semi-Steel—What should your choice be when selecting a catalog die set? Quite often, the answer is a matter of dollars and cents. Naturally, you'd like to tool-up as inexpensively as possible but you must also be sure that an initial savings will not result in excessive replacement costs later on. In making a choice, the complete cost of tooling-up and maintenance during operation should be considered along the following lines:

Initial cost of either type;
Cost of machining either type;
Unit cost of die set per part produced;
Replacement cost in event of damage.

Taking each point individually, if two dies are identically made, except that one is mounted in a semi-steel die set and the other in a steel set:

The semi-steel set will cost less, machine easier, and have a lower cost per unit produced, if not replaced due to damage;



The steel set will cost more and require more machining time but may reduce the probability of breakage if excessive machining is performed on the die bed, and thus reduce the unit cost per part produced.

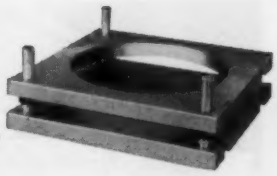
In general, for the average stamping operation, with all points considered, a semi-steel set is probably more economical. For heavy stamping operations, or for those that will run for a long time, a steel set would be the more practical. Either type can be purchased in the two grades of accuracy—Master-Precision and Commercial.

Where the advantages of a steel die set are desired and the savings of a semi-steel set are important, a combination of semi-steel punch holder and steel die holder offers an obvious, though seldom considered, solution.

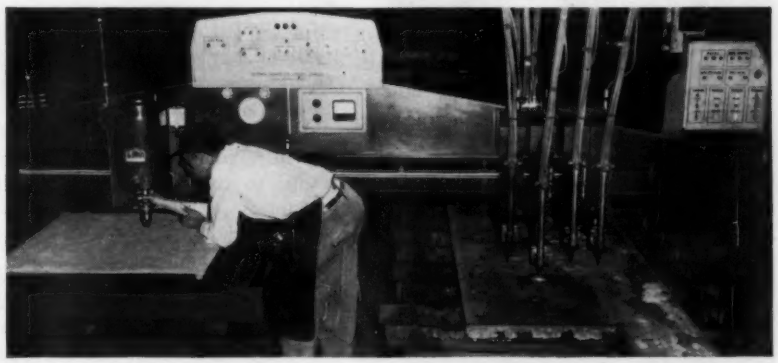
Special Die Sets—When special die sets will have irregular contours, steps, bosses and other built-up sections or machined pockets, a set with these components integrally cast offers extensive savings in machining or fabricating costs.

(Advertisement)

WHERE BETTER STEEL DIE SETS START



Catalog Sets Begin as mill-cut steel punch holders and die beds, shown above in a partial view of the Producto stockpile. These steel blanks are readily available to replace inventories of completely machined components, permit immediate completion of large orders for any one size. Pre-cutting of catalog components leaves flame-cutting equipment free at all times for work on specials.



Special Sets Begin their journey through the Producto plant at modern flame-cutting machines like the one shown above. Always open for specials only, this machine cuts any shape of plate up to 8″ thick. Operator is tracing template, contours of which are reproducing a 3″ thick punch holder for a special set. Latest-type equipment manned by skilled operator gives greater accuracy of dimensions for length and width of sets and cut-out or drop-out holes, by permitting straighter, cleaner flame-cut edges.

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to decide what kind of plan they want, and what coverage should be sought.

Four industries—food, chemicals, electrical equipment, and aircraft—are represented in the discussion of product-liability insurance. The insurance problems peculiar to each industry are described by a major producer in the field.

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NEW FACTORS IN CORPORATE INSURANCE PLANNING — *Insurance Management Series, No. 104. Published by the American Management Association, 330 W 42nd St, New York 36. 71 pages, 6 x 9 in. Price, $1.75, non-members; $1.00, members.*

Technical discussions of various aspects of life and casualty insurance, such as cost factors related to size of policy, the "buyer's market," and the effect of Revenue Act of 1954, make this booklet fairly specialized. There is an interesting discussion of some of the possible effects of the "atomic age" on insurance policies. The atomic industry presents some difficult problems because of the possible size of any catastrophe and the risk of financial ruin to any company found to be the cause of such an accident.

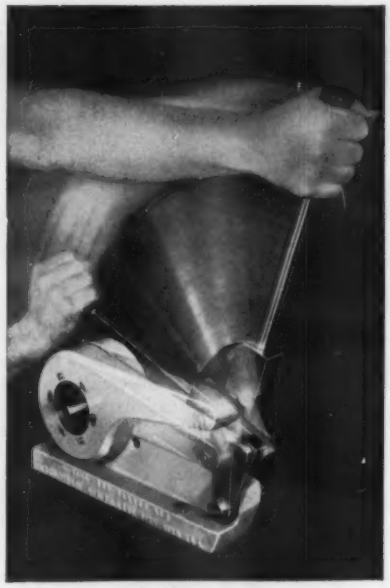
•

ASSURING THE COMPANY'S FUTURE TODAY—*No. 175 in the General Manufacturing Series of the American Management Association, 330 W 42nd St, New York 36. 72 pages, 6 x 9 in. Price, $1.75, non-members; $1.00, members.*

A better title for this book might include the word "growing," for this book has several interesting case histories of how companies either grew rapidly after the war, or actually started within the past few years, and reached multi-milion-dollar sales volumes.

The opening chapters deal with general management principles, such as establishing company objectives so everyone understands what is wanted; what the chief executive should be doing today, which is usually not quite what he would like to be doing; and the handling of paperwork within an organization, to get the most for the least cost.

However, the second part of the book is very detailed and absorbing, showing how several growth companies took steps to insure that they would stay in the market, or to see that they entered new, profitable markets. One of the most interesting



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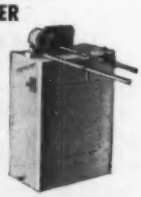

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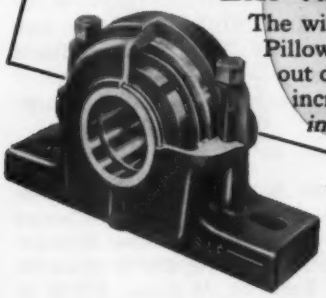

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features of this section is the different — sometimes diametrically opposed—patterns which each company followed, and their reasons for what they did. Examples are the question of public financing, the selection of products and distribution arrangements, and choice of sales territories. For one considering product diversification, this book is good reading.

•

MANAGEMENT PLANNING AND MANPOWER DEVELOPMENT — *No. 173 in the General Management Series of the American Management Association, 330 W 42nd St, New York 36. 44 pages, 6 x 9 in. Price, $1.25, non-members; $1.00, members.*

Transition from a privately owned, proprietary form of management to an active, formal plan requires some drastic changes in thinking and doing. The first section of this AMA book describes how the Illinois Tool Works went through the transition, and where this company stands today, in the matter of long- and short-range planning. From the description given here, the company seems to have adopted almost every known aspect of "modern" management, to shore up the organization and make it "taut." These devices include aptitude testing of all supervisory employees, firm five-year sales plans, three-year plant-needs forecasts, frequent job rating of supervisory personnel, formalized equipment replacement policies, formal training of future management personnel, and many other such planning techniques.

In addition to the description of the Illinois Tool Works, there are two chapters on staff use, giving criteria on proper relationships which should exist between line and staff personnel.

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STRATEGIC AREAS IN COST REDUCTION —*No. 215 in the Manufacturing Series of the American Management Association, 330 W 42nd St, New York 36. 28 pages, 6 x 9 in. Price, $1.25, non-members; $1.00, members.*

Four areas are considered in this study — purchasing, materials handling, preventive maintenance, and the efforts of top management. It may not be exactly fair to consider top management as an "area" for cost reduction, but the point being made is that any serious effort at belt-tightening must begin at the very top, or the work of those lower on the management scale will be

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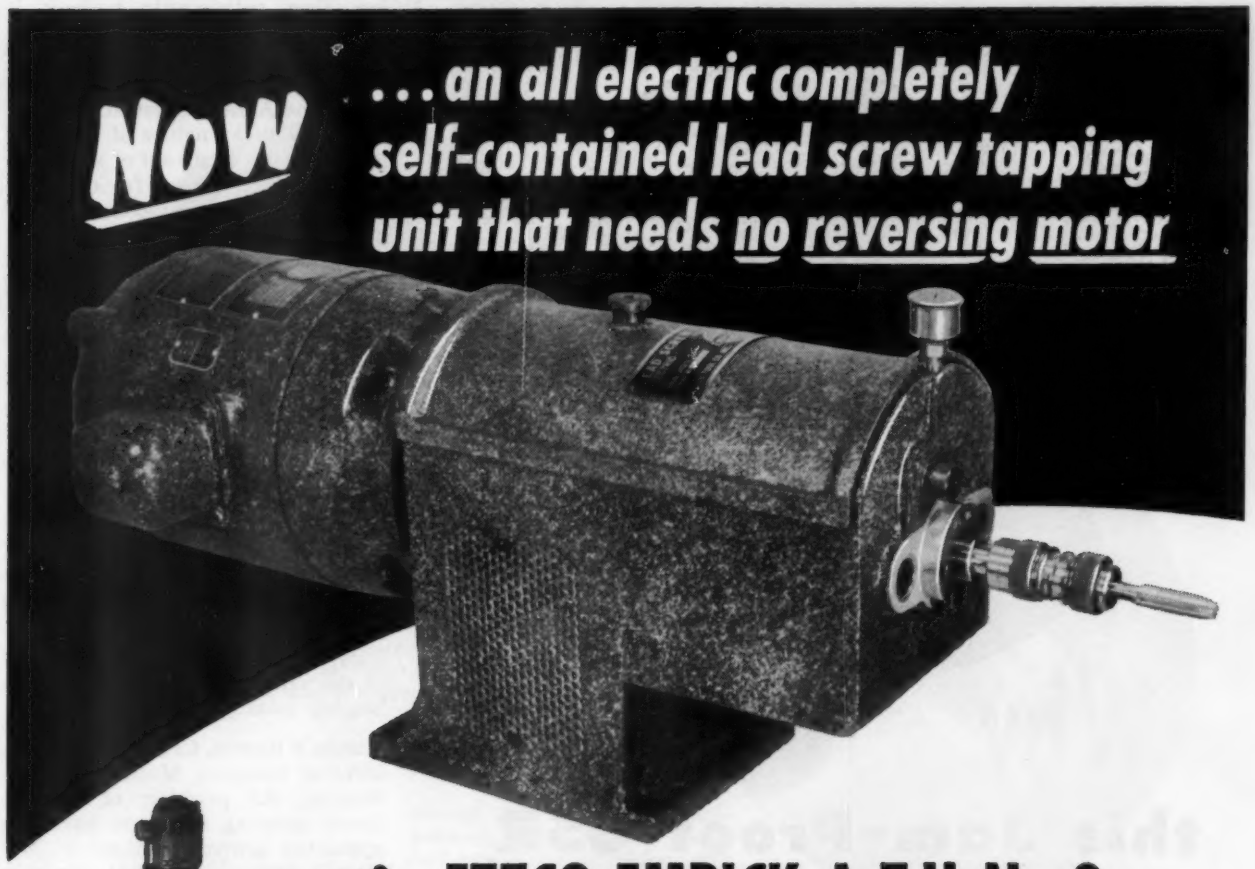

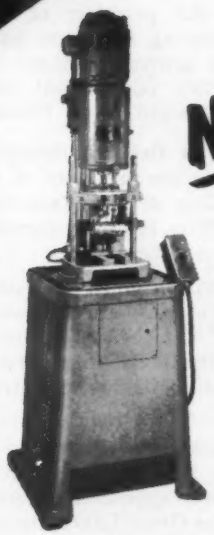

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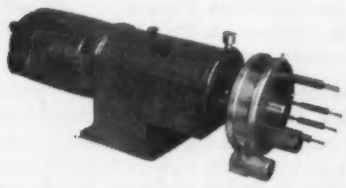

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Work-Saver Pipe Tools

less than enthusiastic—perhaps it will even be hampered by higher authorities.

This book, along with several others the AMA has issued recently, shows the sticky nature of the problem of slicing waste out of a production operation grown fat over the postwar years. Almost every phase of production must be microscopically examined, trimmed to suit, and tested for size. It's not an easy job, but it has to be done.

Names in the News . . .

Arthur J Buckley, assistant sales manager of Pangborn Corp, Hagerstown, Md, manufacturer of blast cleaning and dust control equipment, has been promoted to sales manager.

A G Jarreau, formerly assistant sales manager of the Barden Corp of Danbury, Conn, has been appointed head of the sales department of the ball bearing manufacturer.

Harold E Rowen, formerly vice president of Sintering Machinery Corp, Netcong, NJ, producer of Dwight-Lloyd sintering machines, has been appointed general manager of McDowell Co's (Cleveland) recently acquired Dwight-Lloyd Division.

Dr Irving A Oehler, administrative assistant to the president of American Welding & Manufacturing Co, Warren, Ohio, has been named manager of manufacturing.

John M Wilson, chief electrical engineer of Minneapolis-Honeywell Regulator Co, has been named chief engineer of the development and design division of M-H's Brown Instruments Division.

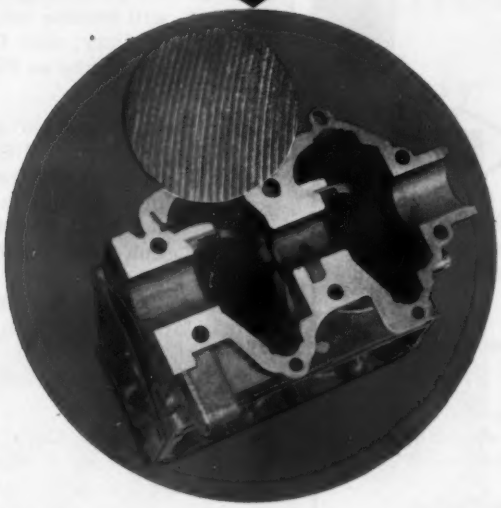
Benjamin Z Ranan, formerly associated with Sonotone Corp, Elmsford, NY, has been appointed general manager of the Great Lakes Stamping & Mfg Co, Toledo, Ohio.

Dale Smith, formerly chief engineer at Marsh Engineering, Detroit, has been appointed general manager of the consolidated Production Broach Corp, Production Tool & Die Co, and Automotive Gear Co of Detroit.

Westinghouse Electric Corp promotes: **Chris H Bartlett,** manager of the manufacturing and repair division, to company vice president; and **Charles C Shutt,** head of the small motor division, to vice president of the firm.

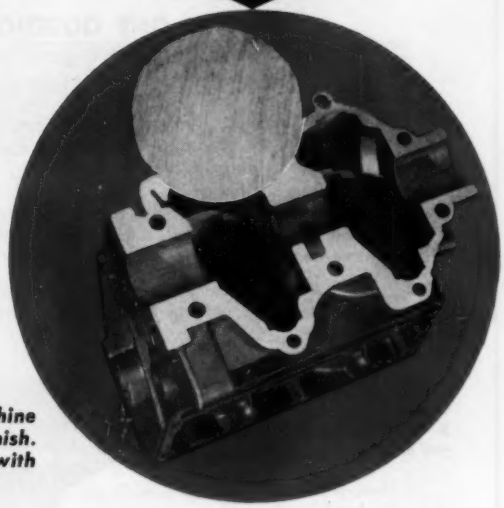
Eaton Manufacturing Co, Cleveland, who recently purchased Fredric Flader, Inc, North Tonawanda, NY,

you can SEE the difference



standard milling machine produces a 125 micro inch machine finish. Part was milled at 40 ipm, at 1,200 RPM cutter speed.

Four times smoother finish when part is milled with Onsrud high speed, high feed milling machine . . .



Onsrud A-245 Milling Machine produces a 32 micro inch finish. Part was milled at 70 ipm with cutter speed of 7,500 RPM.

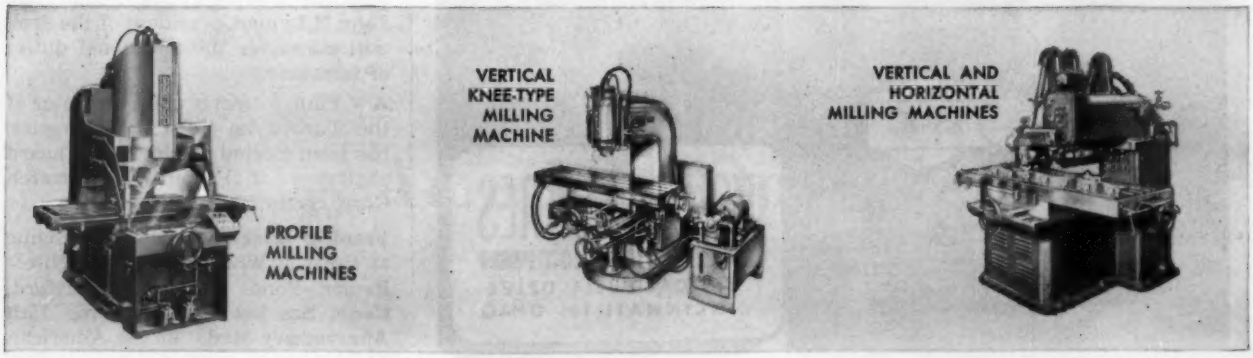
HERE'S PROOF!

. . . that high spindle speeds are needed for effective milling of non-ferrous metals. Here is a graphic demonstration of one of the important advantages of Onsrud high speed milling machines . . . the advantage of smoother, finer finish at high production speeds. The part machined was an aluminum alloy outboard motor cylinder block. Since Onsrud milling machines are specially built for non-ferrous milling, you will find them consistently faster and more accurate for every type of milling job. Your inquiry for complete information is invited. We will be happy to supply a production analysis without charge.

ONSRUD MACHINE WORKS, INC.

3921 Palmer Street • Chicago 47, Illinois

see Onsrud at Booth no. 812



BE *Sure* YOUR
NEW ENGINE LATHE
CAN *Take* IT!

The engine lathe you buy today could be the one you will call upon for 'round-the-clock production. Make sure, before you buy, that the lathe of your choice can take such punishment.

ASK ONE QUESTION!
What is the headstock gear arrangement?
MAKE SURE OF THREE POINTS

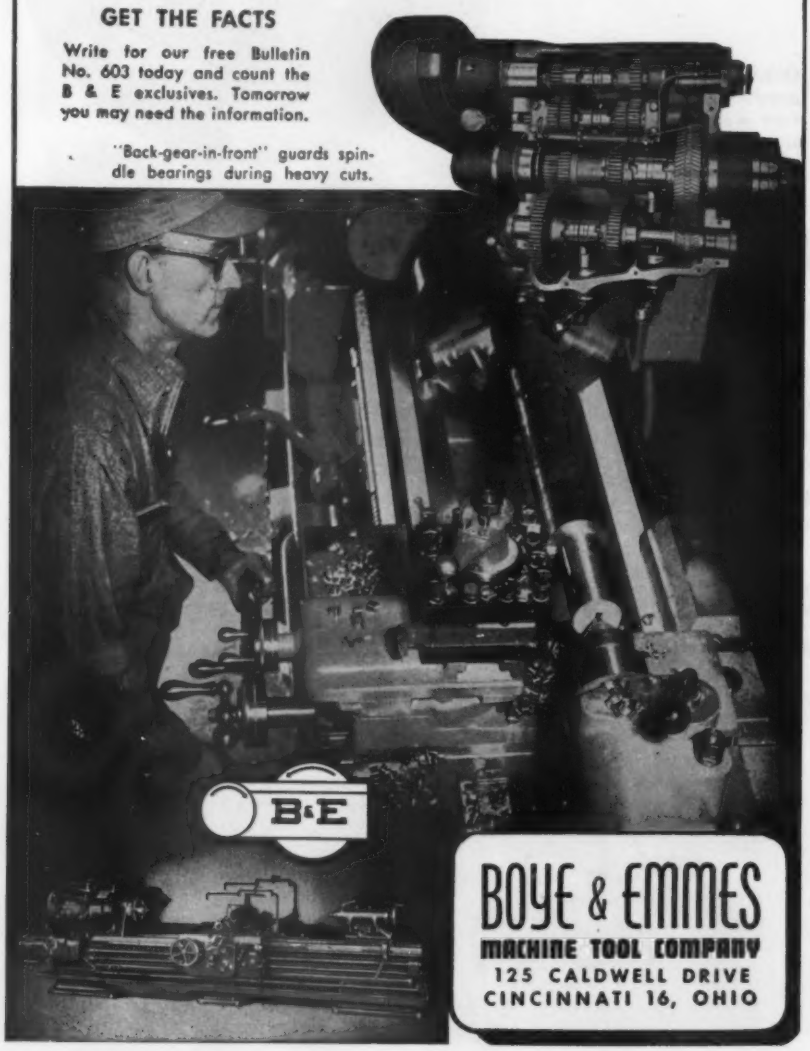
(1) That all gears are arranged in a horizontal plane; easy of access.
(2) That gears are in constant mesh, with speed changes effected by means of sliding jaw clutches; eliminating gear wear due to shifting action.
(3) That the "back gear" is in *front* of the spindle, exerting its powerful downward thrust to offset the lifting action of the tool when heavy cuts are made.

On these three points long life for engine lathes depends. At these three points Boye & Emmes Long Life, Heavy Duty Engine Lathes excel.

GET THE FACTS

Write for our free Bulletin No. 603 today and count the B & E exclusives. Tomorrow you may need the information.

"Back-gear-in-front" guards spindle bearings during heavy cuts.



BOYE & EMMES
MACHINE TOOL COMPANY
125 CALDWELL DRIVE
CINCINNATI 16, OHIO

aircraft engineering and research company, has named **Fredric Flader** to continue in the capacity of president. **M P Winther,** Eaton vice president in charge of engineering and research, will become vice president of the subsidiary; and **Clarence T Kabel** will continue as Flader's secretary-treasurer.

American Zinc Institute elects: **F S Mulock,** president of US Smelting, Refining & Mining Co, Boston, Mass, as president of the Institute; and as vice presidents—**C Merrill Chapin, Jr,** St Joseph Lead Co, New York; **R G Kenly,** New Jersey Zinc Sales Co, New York; **E H Snyder,** Combined Metals Reduction Co, Salt Lake City, Utah. **John L Kimberley** of the administrative staff has been named secretary.

Bristol Engineering Corp, Bristol, Pa, elects new officers: **E Walsh,** chairman of the board; **Raymond Wiese,** president and treasurer; **John Stahl,** vice president and administrative assistant to the president; **Charles Dickert,** secretary.

William D Black, formerly associated with P W Voss & Associates, Chicago representative of Automatic Transportation Co, has been named Automatic's sales manager for rider-design industrial trucks. He succeeds **George A Hinckley,** promoted to general sales manager of the company.

Henry F Dever, president of Brown Instruments Division, Minneapolis-Honeywell Regulator Co, has been elected president of the Scientific Apparatus Makers' Association.

Sig Straus has been appointed national sales manager of Larkin Welder & Machine Co, Brooklyn, NY.

Robert W Goode, formerly general foreman of the BE-GE Manufacturing Co, Gilroy, Calif, has been named works manager of the Petersen Engineering Co, Santa Clara, Calif.

Joseph Cavicchi, a founder and present treasurer and superintendent of Massachusetts Gear & Tool Co, Woburn, Mass, will retire from active management on June 30. He will continue to serve as board chairman. **John H Lyman,** president of the firm, will take over the additional duties of treasurer.

A V Finn, formerly chief inspector of the Turbodyne Corp, Los Angeles, has been elected president and board chairman of Propulsion Research Corp, Santa Monica, Calif.

Frank O Hoagland, master mechanic at Pratt & Whitney, Division Niles-Bement-Pond Co, West Hartford, Conn, has been awarded the 75th Anniversary Medal of the American

Which Man is Better Protected Visually?

Each of the workers in the illustration is wearing Safety R glasses. On the surface, it *looks* as if each has equal correction and protection on the job. But appearances can be deceptive.

One of these men has *two* big advantages over the other.

1. He has received the benefit of the proper procedures in eye correction — from the original examination right thru verification and fitting. (In other words the full professional services have been rendered in his behalf.)

2. He has received the benefit of top, *unquestionable* quality in both the lenses and frame of the eyewear device itself. For both are marked with the AO† trademark.*

Safety is our business — and the business of Industry. Examination, refraction, verification and the fitting of prescription glasses are the responsibilities of the professions.

Eye injuries cost more than $5.00 *per employed worker*, and more than 98% of the injuries are preventable when exposed workers wear safety glasses — at an average cost of $2.30.

Ask an AO Safety Representative for the complete story. Or write American Optical Company, 5136 Vision Park, Southbridge, Mass., for booklet.

* This trademark on safety frames assures a construction of corrosive-resistant metal or flame-resistant plastic and meets all safety specifications. On lenses it indicates heat strengthening and the meeting of rigid specifications for thickness and impact resistance.

†T.M. Reg. by American Optical Company

American Optical

SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

QUALITY...
Quality that delivers more cutting mileage. There's quality in the raw materials . . . in the design . . . in the craftsmanship . . . all of which are doubly assured by our rigid inspection. These are drills for top production!

CHICAGO LATROBE

DOUBLE-CIRCLE DRILLS

SERVICE
You can rely on your CHICAGO-LATROBE DISTRIBUTOR for fast delivery and service . . . Consult him on your technical problems, too. Through his close relation with our factory, he can deliver what you need when you need it.
*GUN DRILL
CONTACT THE CHICAGO-LATROBE DISTRIBUTOR IN YOUR AREA. OVERNIGHT SERVICE ANYWHERE.

DOUBLE CIRCLE TOOLS

Chicago-Latrobe

416 W. ONTARIO STREET, CHICAGO 10

DRILLS • REAMERS • COUNTERSINKS • COUNTERBORES • CARBIDE TOOLS • SPECIAL TOOLS

Society of Mechanical Engineers, in recognition of his services extending over many years in advancing the engineering profession. Mr Hoagland, active in the ASME since joining the organization in 1912, has served as chairman of several national committees, and vice president in 1938.

Alexander Root, formerly associated with Boeing Aircraft, has been named to head Precision Product's recently opened plant at Phoenix, Ariz, manufacturing parts and supplies for all types of electronic devices. Associated with Mr Root are **Roy Wilkinson,** formerly of North American Aviation, and **John Serafin,** previously connected with General Motors' research laboratory.

Carl Mayer, Jr, vice president and general manager of Carl Mayer Corp, Cleveland industrial oven design firm, has been named to succeed his father as president of the company. Mr Mayer, Sr, founder, died April 20.

Harry C Platt, vice president, production, for the Engineered Castings Division of American Brake Shoe Co, has been appointed president of the division, headquartered in Rochester; he succeeds **N G Belury,** recently named sales vice president of the company.

Lincoln Engineering Co, St Louis, Mo, manufacturer of lubricating equipment, promotes: **Carl H Mueller,** director of engineering, to vice president, engineering; and **John E Renner,** general sales manager, to vice president, sales.

Frank J Kearns, vice president, engineering, Bridgeport Brass Co, has been named to the newly created post of vice president, manufacturing.

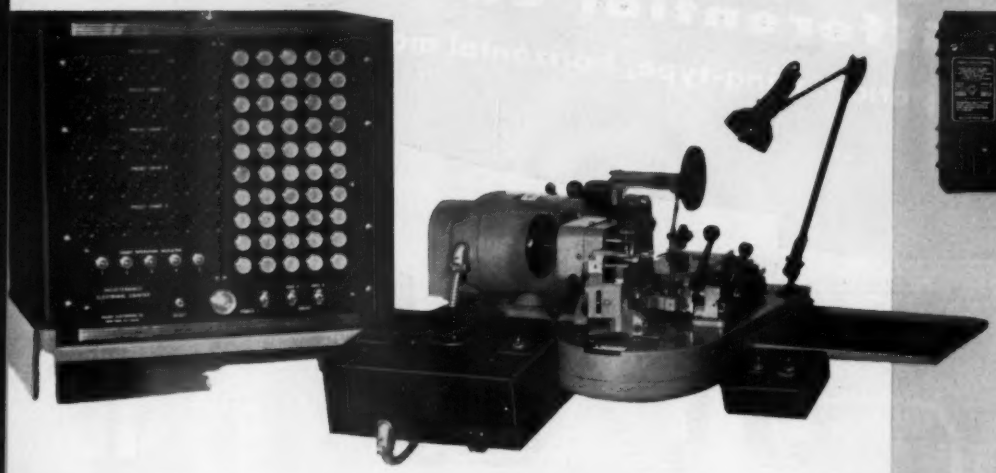
American Chain & Cable Co appointments: **Cyrus N Johns,** president, named chief executive officer to succeed **Wilmot F Wheeler,** who continues as board chairman; **Stanley Mann,** retiring as treasurer, to continue as a director; **Arthur C Laske,** secretary, takes over, in addition, Mr Mann's post; **Wilmot F Wheeler, Jr,** assistant to the president, elected a vice president.

E W Bliss Co's Mackintosh-Hemphill Division (Pittsburgh) appointments: **Col J S Ervin,** formerly M-H president, to director and member of the executive committee of Bliss; **J R Patterson,** former vice president, sales, of M-H, to vice president of Bliss in charge of the M-H Division; and **C H Paul,** M-H vice president and treasurer, named assistant treasurer of Bliss.

Type 1701-A
1/15 hp and less $75.

Variac MOTOR SPEED CONTROL

for D-C Motors from A-C Lines



Type 1700-B
1/4 and 1/3 hp. $170.

"...provides good control at all times... smooth operation . . . neat appearance ...is compact in size."

Boesch Manufacturing Company

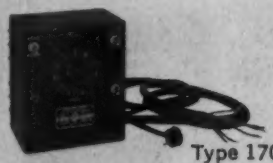
Type 1702-A
½ and ¾ hp. $245.

The Boesch Manufacturing Company builds the G-R Type 1700-B Variac Motor Speed Control into their precision Toroidal Winder because, in their own words . . .

"With the advent of closer winding specifications, smooth operation is *essential*. We find it extremely helpful to provide slow acceleration and deceleration of the winding speed at start and finish of the operation. This is especially desirable when using lighter wire sizes.

"The General Radio Motor Control is used to control the shuttle speed on our machine. It provides excellent control at all times on this operation and holds speed steady at a given setting. The dynamic braking action is also highly desirable, especially where the core loop counter is used. Here dynamic braking provides for a minimum runover of turns.

"The Control is compact in size and presents a neat appearance which fits well into the overall design of our Winder."



Type 1703-A
1/12 to 1/6 hp. $97.50.

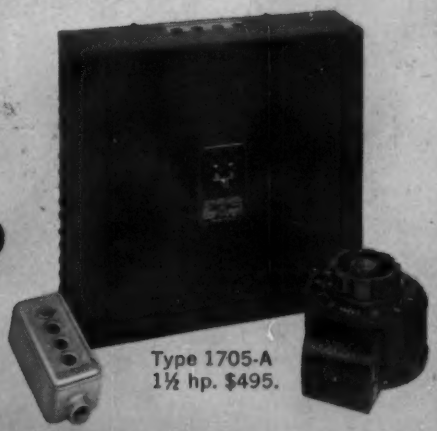
VARIAC Motor Speed Controls are available in a wide variety of sizes from 1/15 hp to 1½ hp. Prices are from $75 to $495. Where a manufacturer wishes to combine this control with his equipment in his own cabinet, the basic elements can be provided as a sub-assembly.

Write For More Information

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts, U.S.A.

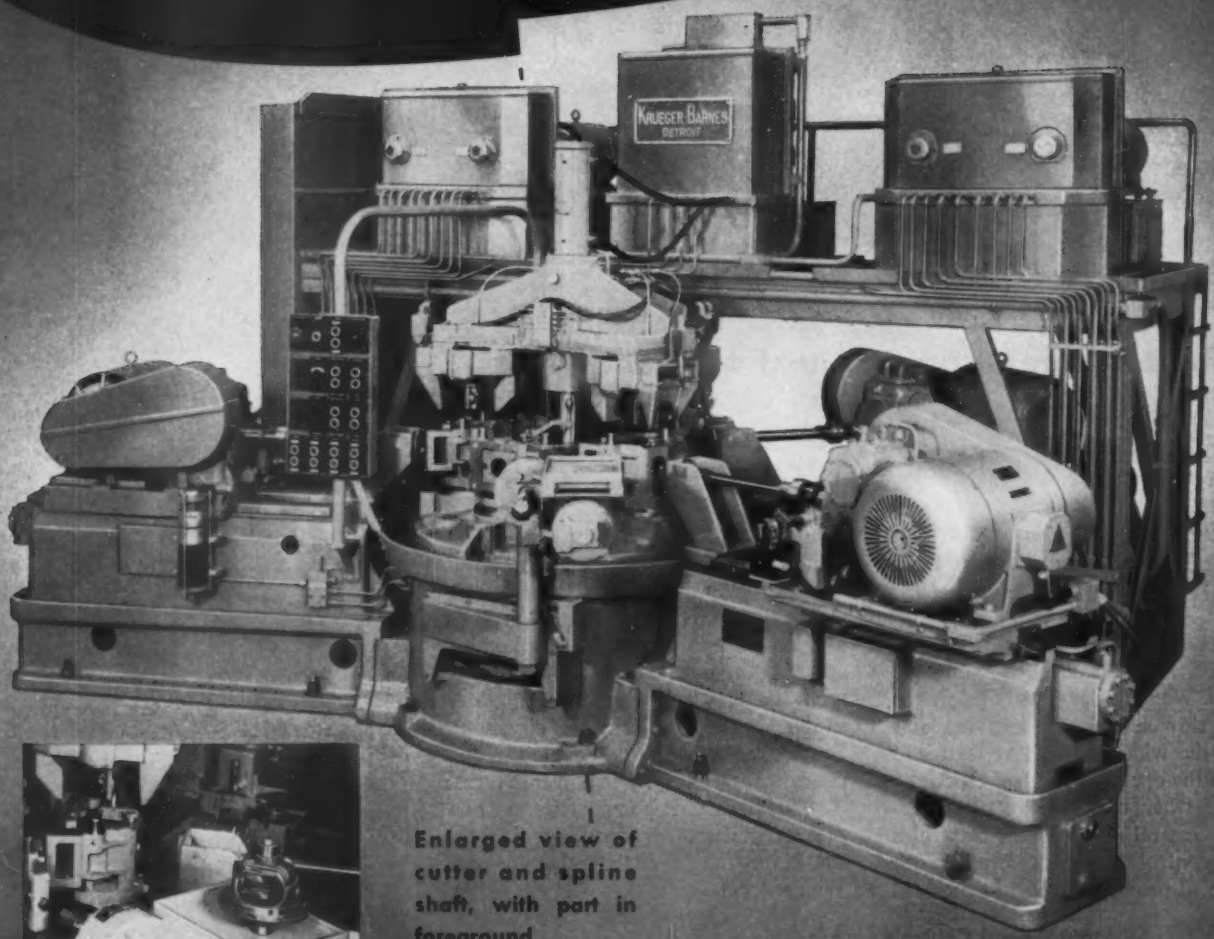
90 West St. NEW YORK 6
920 S. Michigan Ave. CHICAGO 5
1000 N. Seward St. LOS ANGELES 38
8055 13th St., Silver Spring, Md. WASHINGTON, D.C.

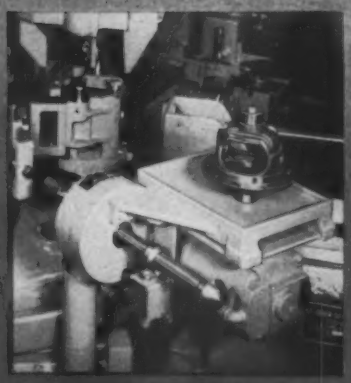


Type 1705-A
1½ hp. $495.

Roughing and Finishing Two Spherical Gear Seats In Differential Case

. . . on a five-station, wing-type, horizontal machine





Enlarged view of cutter and spline shaft, with part in foreground.

VISIT US AT BOOTH 1223,
Machine Tool and Production Engineering Show

DESIGNERS AND BUILDERS OF HIGH PRODUCTION MACHINE TOOLS

KRUEGER-BARNES Corporation

1469 E. GRAND BLVD., DETROIT 11, MICHIGAN

HOW TO RATE A CUTTING OIL

FOR HIGH PRODUCTION ON TOUGH JOBS

There has never before been a cutting oil selection chart such as Atlantic now offers. It rates oils on job efficiency, not just chemical composition.

This cutting oil chart uses 3 variables to give you the "Cutting Units" which can then be used to select the proper Atlantic Cutting Oil for the job.

Here's what the chart does for you . . .

1 *Provides a* **CUTTING INDEX**—*or rate of metal removal*

2 *Lists* **TOOL MATERIAL**—*by type and composition*

3 *Relates* **METAL** *machinability to both Cutting Index and Tool Material*

4 *Selects proper* **OIL**—*by cross reference of Cutting Units it names the Atlantic Cutting Oil to use*

With Atlantic Cutting Oils, you can maintain high production rates on hot, tough jobs—and without foul odors. Work is visible right through the oil. The oils are compatible when blended—even down to the heaviest grades. Operators like these oils, too, because they don't indelibly stain hands or clothing.

Get complete information on these new oils and your copy of the Atlantic Cutting Oil Selection Chart. Write, wire or phone the nearest Atlantic office. The Atlantic Refining Co., Dept. R-6, 260 South Broad St., Philadelphia 1, Pa.

ATLANTIC

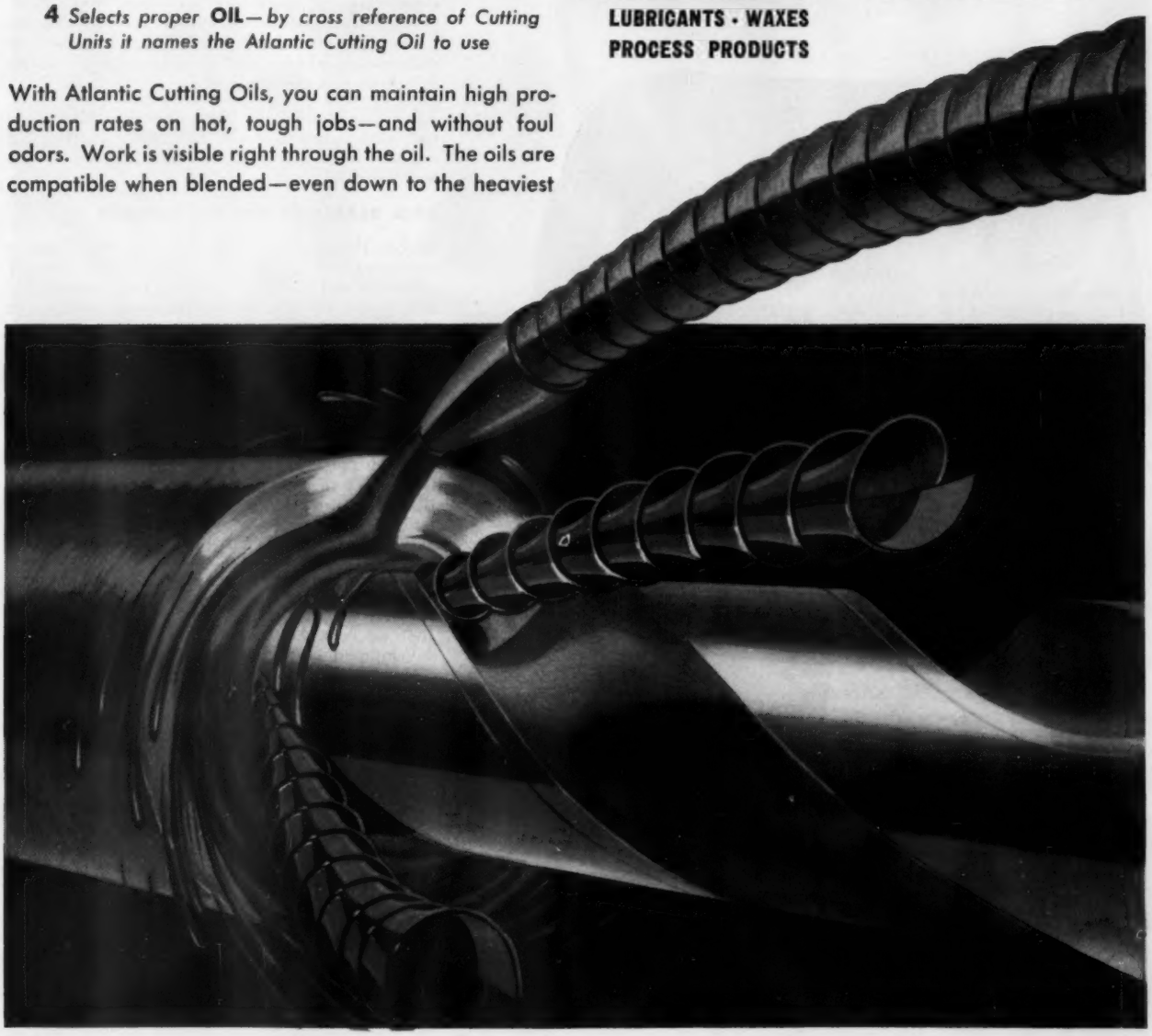
LUBRICANTS · WAXES
PROCESS PRODUCTS

PROVIDENCE, R. I.
430 Hospital Trust Bldg.

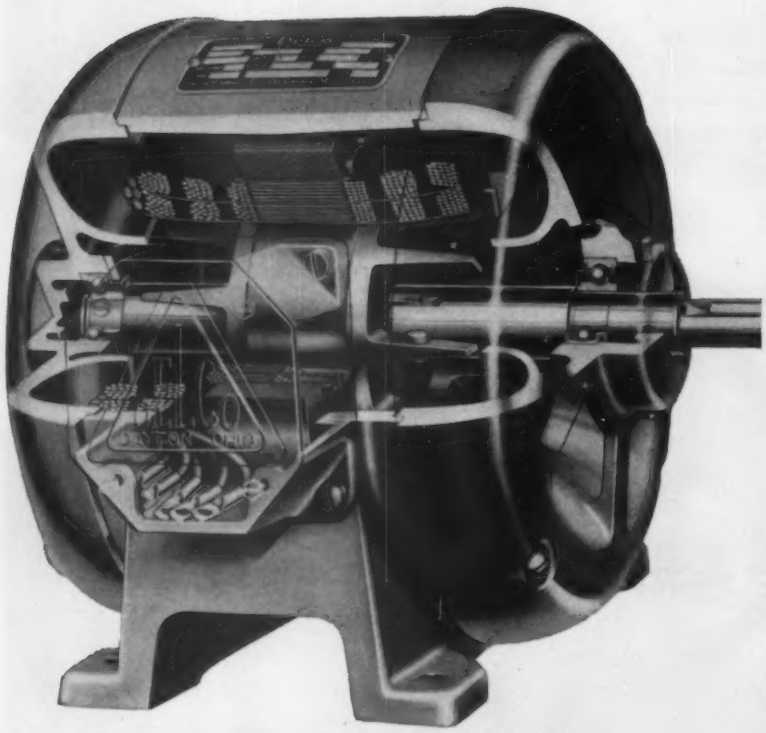
SYRACUSE, N. Y.
Salina and Genesee Sts.

READING, PA.
First and Penn Aves.

PITTSBURGH, PA.
Chamber of Commerce Bldg.



Answering the need for VERSATILITY in electric motors!



This Delco general-purpose, drip-proof motor is equipped with New Departure self-enclosed ball bearings. They not only assure permanently accurate support of the rotor shaft under all load conditions, but in normal operation they reduce bearing lubricating requirements to just about zero. However, should extra-severe conditions warrant it, the lubricant can be replenished quickly by removing the pipe plugs.

Note that the bearings have built-in seals on the inside faces, thereby preventing grease leakage into the motor, and the outer faces have metal shields which keep foreign matter out of the bearings. The shields do, however, permit entry of just the right amount of grease from the space in the end bell for perfect bearing operation, yet prevent excessive lubrication which could cause overheating.

End applications for modern electric motors are extremely varied. They may be mounted in positions from horizontal to vertical. Radial and thrust loads may be encountered in numerous combinations. Mounting locations may make periodic lubrication difficult or costly. Atmospheres may be charged with abrasive dust, or extreme cleanliness may be mandatory, with no lubricant leakage allowable.

All these conditions are directly related to the motor bearings—in fact *the versatility of a motor, or its ability to meet them, depends on the bearings used.*

BALL BEARINGS ARE THE ANSWER

Among the important features of the ball bearing are its ability to resist loads imposed from any direction and to locate rotating parts accurately and positively for many years of service. In electric motors accurate rotor-to-stator relationship is maintained regardless of mounting position, and bearings are cool-running at all speeds.

Lubrication factors are important too. Motors equipped with New Departure self-sealed or shielded bearings may be installed in difficult-to-reach places because the bearings will operate for years under normal conditions without attention for lubrication or adjustments of any kind.

With New Departure self-sealed, grease-lubricated ball bearings, lubricant leakage is no problem and the bearings are fully protected from abrasive dirt.

Just as New Departure has pioneered bearing developments which have added so greatly to the versatility of today's electric motors, so will New Departure be first with the bearing advances of tomorrow. New Departure, Division of General Motors Corporation, Bristol, Connecticut.

NEW DEPARTURE
BALL BEARINGS
NOTHING ROLLS LIKE A BALL

Campbell Abrasive Cutters

ACCO products

CAMPBELL Abrasive Cutting is SMOOTH cutting —high quality at low cost

These CAMPBELL features will save you money

- **Eliminate annealing cost when cutting forged sections from bar lengths**
- **No added cost for smoothing operations**
- **Cutting accuracy reduces scrap losses**
- **Metal can be cut in practically any condition**

• Almost any type of material, whether hard or soft, can be economically cut by CAMPBELL Abrasive Cutters. The excellent finish obtained eliminates milling or other finishing operations in most cases.

Testing procedure by CAMPBELL Engineers will show conclusively which abrasive cutting machine will do the most economical job on your cutting application. Latest type CAMPBELL machines are available to save you time and money on every type of cutting operation.

Let us send you Bulletin DH-301 on "Principles of Abrasive Cutting"

ACCO TRADE MARK

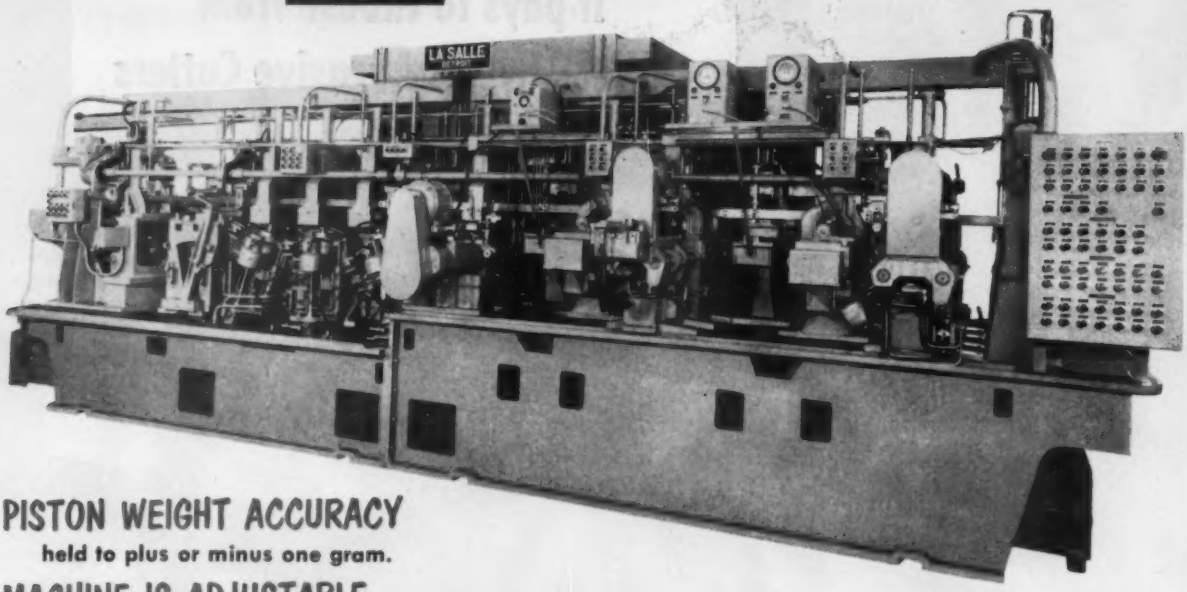
Campbell Machine Division
AMERICAN CHAIN & CABLE

923 Connecticut Avenue, Bridgeport 2, Connecticut

Wet and Dry Cutters and Nibblers

La Salle AUTOMATED PISTON LINE

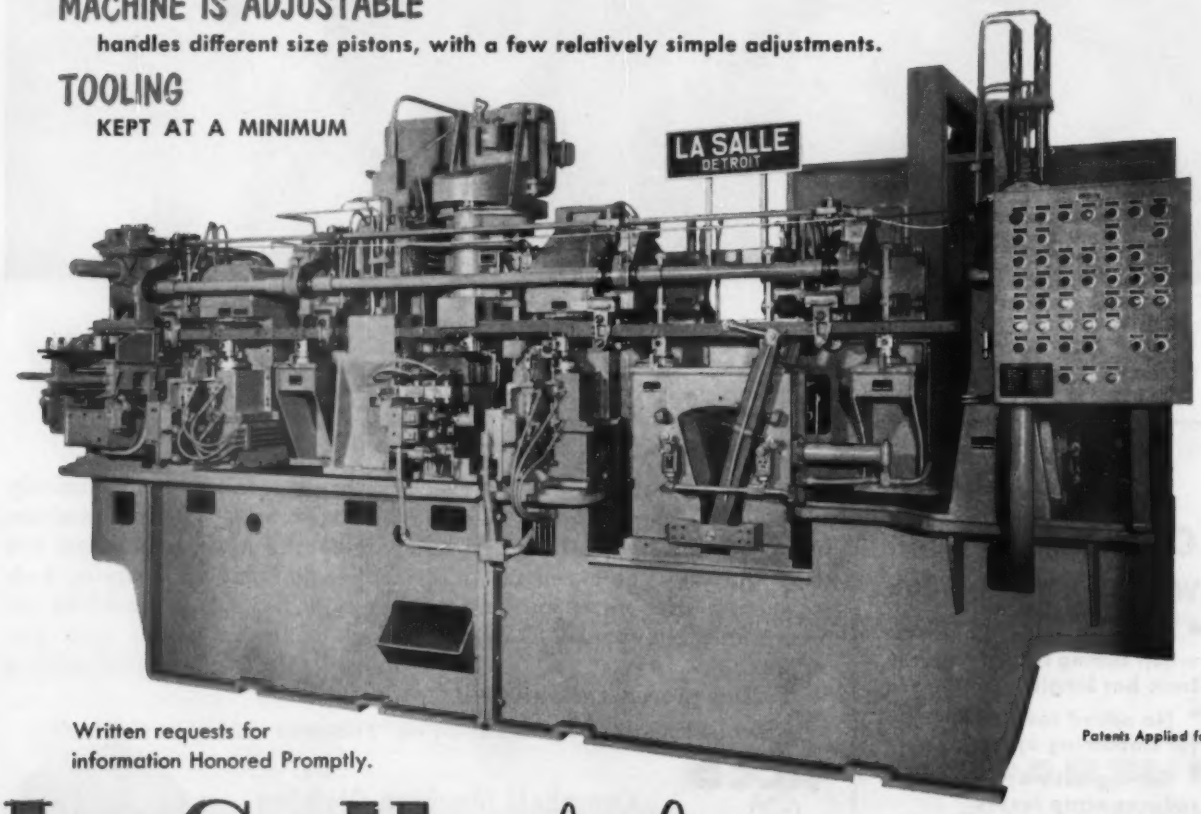
PRODUCES 400 PISTONS PER HOUR



PISTON WEIGHT ACCURACY
held to plus or minus one gram.

MACHINE IS ADJUSTABLE
handles different size pistons, with a few relatively simple adjustments.

TOOLING
KEPT AT A MINIMUM



Written requests for information Honored Promptly.

Patents Applied for.

La Salle tool, inc.

ENGINEERING & BUILDING
SPECIAL MACHINERY

3840 EAST OUTER DRIVE • DETROIT 34, MICHIGAN

Rush Stamping Company gives stamp of approval to Cities Service

Some of Rush's Stampings awaiting shipment. The rapidly growing, 4½ year old firm makes parts for auto hot water heaters, brake levers, vacuum cleaners, and air conditioning units.

Chief Engineer Fred W. Selter switched to Cities Service drawing oil a year ago. He praises it for eliminating need for many compounds, preventing build-up on dies, and lowering costs.

Praises Cities Service drawing oil as timesaver, worksaver, moneysaver.

The four and a half year old Rush Stamping Company of Toledo, Ohio, has already grown into a sizeable operation. Producing stampings for air conditioning units, vacuum cleaners and automotive parts, the company utilizes 41 punch presses ranging from 35 to 400 tons in pressure.

Like many other stamping companies, Rush was using a variety of paste type compounds for its drawing operations and suffering the penalty of heavy costs and build-up on dies which such compounds inflict. Then, a year ago, they switched to Cities Service drawing oil.

Here are the results in the words of F. W. Selter, Chief Engineer: "Now one Cities Service Oil does our variety of jobs, completely eliminating previous number of products and compounds required. This oil prevents build-up on dies formerly created by our paste type compounds, and in some applications saves as much as 50% in costs over these compounds. In addition, Cities Service has eliminated supply problems by offering us local warehousing and engineering services."

Learn more about Cities Service drawing oils which have already received the stamp of approval from so many firms. Talk with a Cities Service Lubrication Engineer. Or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

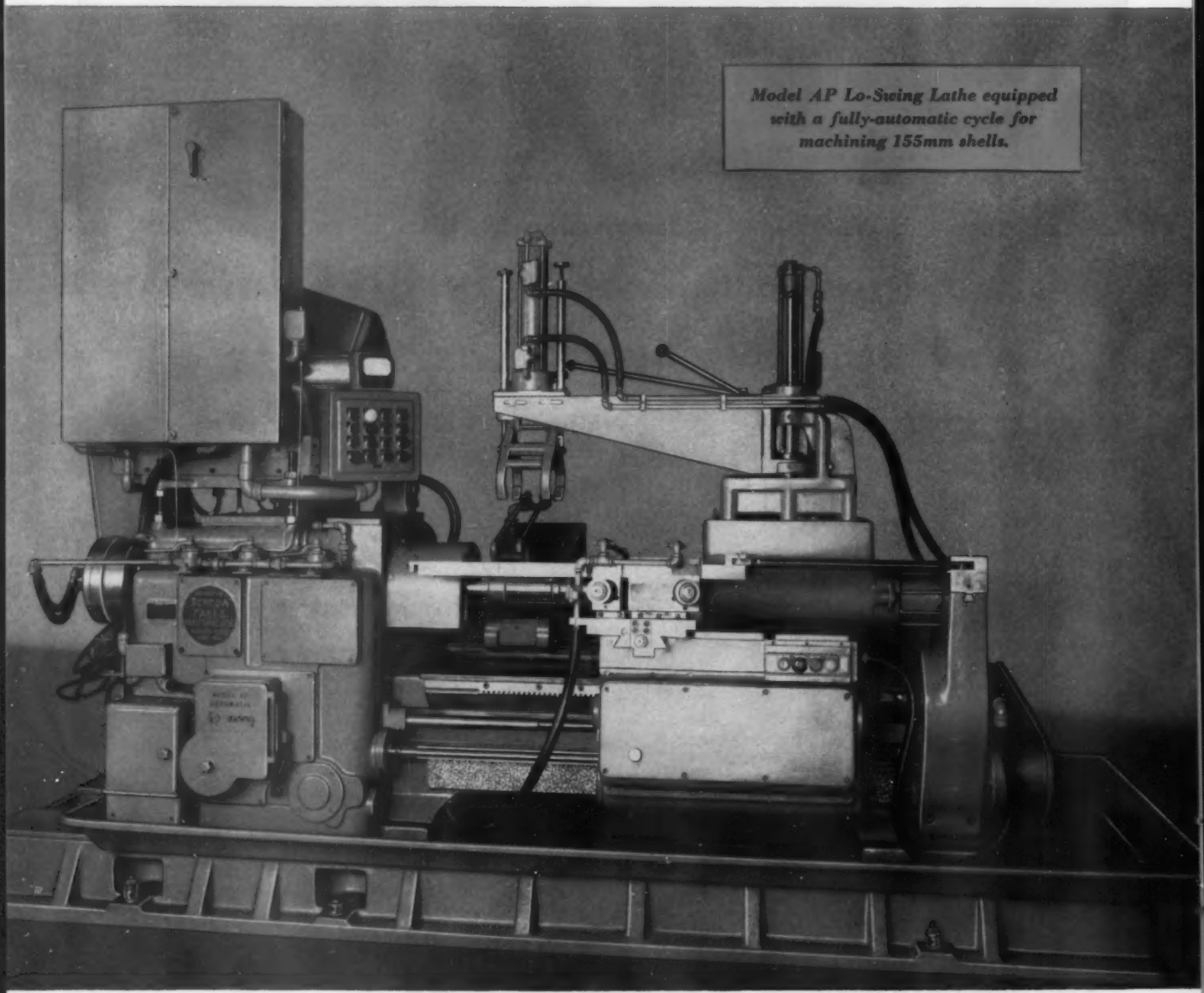
CITIES SERVICE

QUALITY PETROLEUM PRODUCTS

MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE *Lo-swing* PEOPLE" SENECA FALLS, NEW YORK

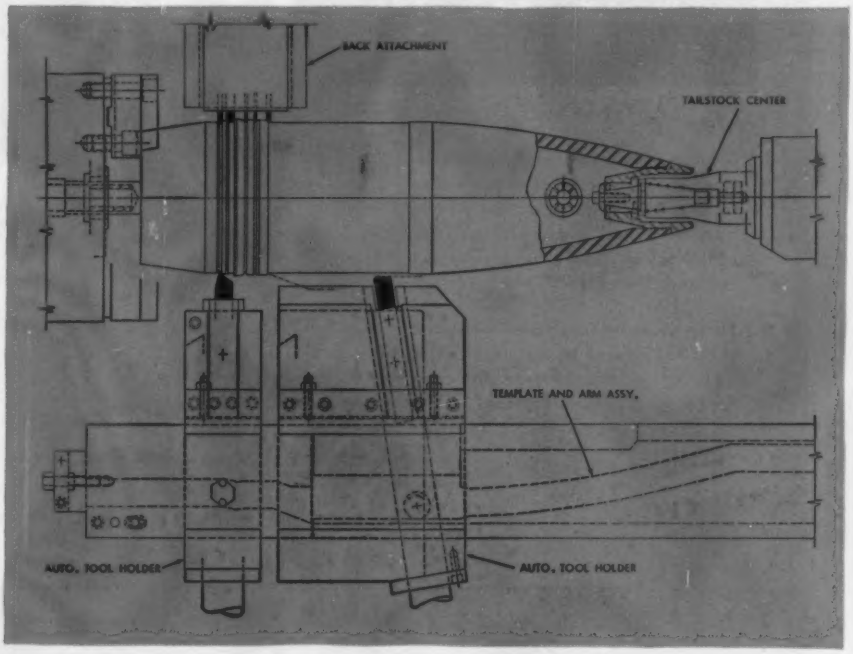
MODEL AP *Lo-swing* LATHE SPEEDS MACHINING OF 155mm SHELLS



Model AP Lo-Swing Lathe equipped with a fully-automatic cycle for machining 155mm shells.

PRODUCTION COSTS

THE MONTH



PROBLEM: To finish turn ogive and copper band on 155mm shells.

SOLUTION: A Model AP Lo-swing Lathe, tooled as illustrated, was selected for this job since its rack and pinion carriage feed permits any length of feed within the capacity of the bed. This feature was particularly advantageous because of the exceptional length of the nose of the shell and overlapping of multiple tools was not permitted.

For this particular operation, the machine, which is basically a semi-automatic lathe, was equipped with a full automatic cycle. The operator simply loads and unloads the shells with the pneumatic loader and pushes the starting button. The spindle stops automatically at the end of the machine cycle with the carriages and tools returned to the starting position.

The spindle drive is through a variable speed electric motor with an automatic control mechanism which maintains a constant cutting speed over the full length of the ogive. This is important, as the nose of the shell must have a fine, smooth and polished surface, which is obtainable only with a constant cutting speed. Production is also improved when a constant cutting speed is maintained.

The line drawing shows the tooling designed for this job. The piece is held and driven with a three-jaw, air chuck and supported on the tailstock end with an expanding collet. The front template which controls the form of the ogive and the copper band is clearly shown as well as the automatic back squaring attachment which carries the grooving tools.

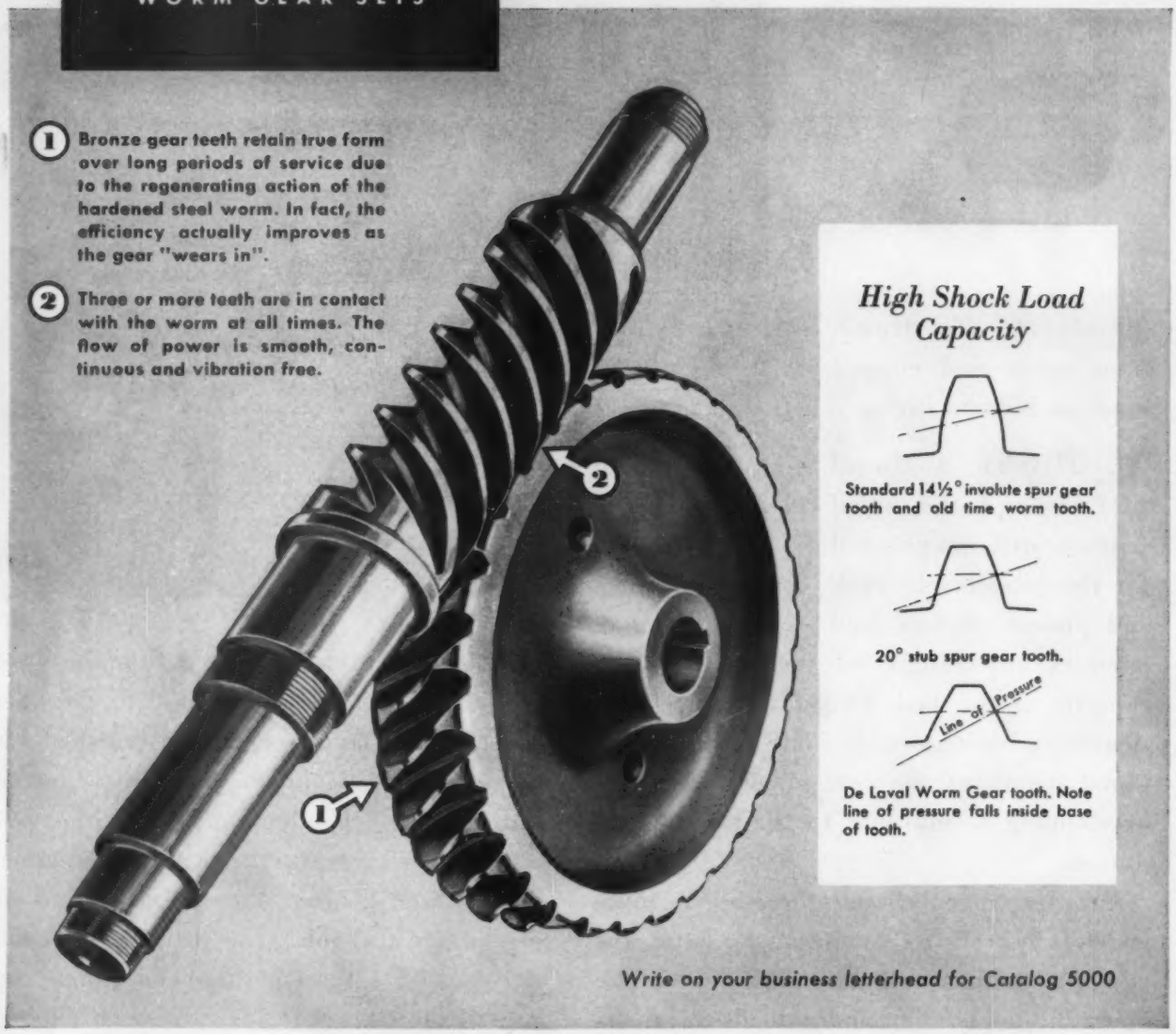
Production is 44 shells per hour at 100% efficiency. Bring your turning problems to Seneca Falls.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

ARE LOWER WITH *Lo-swing*

DE LAVAL
WORM GEAR SETS

can take "hard knocks"


1 Bronze gear teeth retain true form over long periods of service due to the regenerating action of the hardened steel worm. In fact, the efficiency actually improves as the gear "wears in".
2 Three or more teeth are in contact with the worm at all times. The flow of power is smooth, continuous and vibration free.
1
2
High Shock Load Capacity
Standard 14½° involute spur gear tooth and old time worm tooth.
20° stub spur gear tooth.
Line of Pressure
De Laval Worm Gear tooth. Note line of pressure falls inside base of tooth.
Write on your business letterhead for Catalog 5000

De Laval worm gear sets are designed to take punishment year-in, year-out. Gear teeth are under a crushing, instead of a bending load. Thus they withstand extremely high momentary and shock loads damaging to other forms of gearing. They need little attention even under the most rugged operating conditions.

De Laval manufactures these heavy-duty sets in a wide range of ratios from 3:1 to 100:1, with ratings of .1 hp to 550 hp and center distances from 3" to 36". It pays to design around these De Laval stock sizes. Special sets, however, can be furnished to any detailed specifications.

Proven applications of De Laval worm gear sets include the machine tool industry, rolling mills, process machinery, cranes and hoisting equipment and many similar uses.

DE LAVAL *Worm Gear Sets*

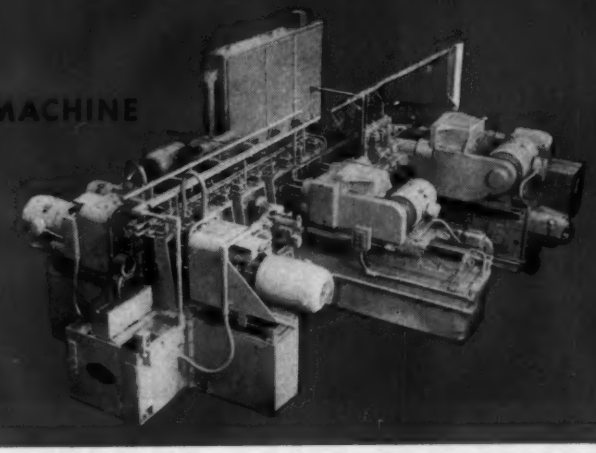
DE LAVAL STEAM TURBINE COMPANY
887 Nottingham Way, Trenton 2, New Jersey

10 Station Automatic In-Line TRANSFER MACHINE

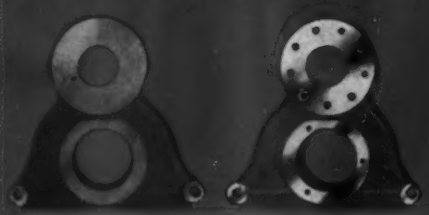
BAKER

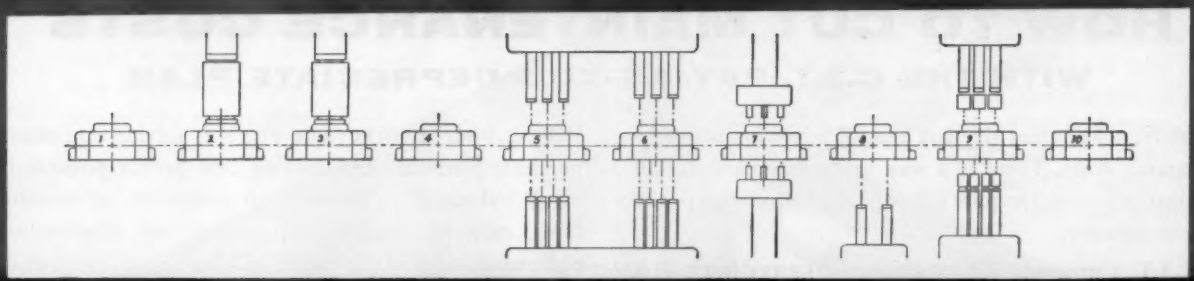
Performs Multiple Operations on Tractor Housings

THE MACHINE



THE PART





THE OPERATIONS

STATION NO. 1
LOAD 1 PART

STATION NO. 2
UNIT NO. 1
COMB. SEMI. FIN. BORE 5.165 & 3.249 & 2.861 DIAS.
COMB. SEMI. FIN. BORE 4.425 THRU BOTH WALLS

STATION NO. 3
UNIT NO. 1
COMB. FIN. BORE 5.180 & 3.264 & 2.876 DIAS.
COMB. FIN. BORE 4.440 THRU BOTH WALLS

STATION NO. 4
IDLE

STATION NO. 5
UNIT NO. 2 "U" DRILL 5 HOLES
31/64 DRILL 6 HOLES

UNIT NO. 3 31/64 DRILL 8 HOLES
21/32 DRILL 1 HOLE
"U" DRILL 6 HOLES
23/32 DRILL 1 HOLE

STATION NO. 6
UNIT NO. 2 ½ CHAMFER 5 HOLES
⅝ CHAMFER 6 HOLES

UNIT NO. 3 ⅝ CHAMFER 7 HOLES
13/16 CHAMFER 1 HOLE
½ CHAMFER 6 HOLES
23/32 DRILL 1 HOLE
COMB. COUNTERBORE
.796 & CHAMFER 1 HOLE

STATION NO. 7
INSPECTION

STATION NO. 8
UNIT NO. 4
.6910 REAM 1 HOLE
.8157 COUNTERBORE 1 HOLE

STATION NO. 9
UNIT NO. 5 7/16-14 N.C. TAP 5 HOLES
9/16-12 N.C. TAP 6 HOLES

UNIT NO. 6 7/16-14 N.C. TAP 6 HOLES
9/16-12 N.C. TAP 7 HOLES
½-14 N.P.T. TAP 2 HOLES

STATION NO. 10
UNLOAD 1 PART

Whatever Your Specific Job Problem, Consult Baker Engineers. Write

BAKER BROTHERS, INC., TOLEDO, OHIO

DRILLING - TAPPING - REVERSE SPOT FACING - CONTOUR BORING MACHINES

HOW TO CUT MAINTENANCE COSTS

WITH THE C.I.T. PAY-AS-YOU-DEPRECIATE PLAN

Obsolete machines give you low efficiency and high maintenance costs. There is a way to cut maintenance costs drastically—and acquire efficient, more profitable production capacity.

C. I. T. Corporation PAY-AS-YOU-DEPRECIATE PLAN gives you a businesslike way of financing new machinery purchases. Simultaneously, the plan lets you take fullest advantage of any one of the new fast depreciation methods. Payments on the machinery closely approximate your depreciation allowances. In effect, you write off the payments as expense.

PAYD PLAN lets you finance new equipment with:

1. Minimum use of your cash.
2. Instalment payments geared to fast depreciation write-off advantages.
3. Long terms.

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Terms range from six to ten years. The PAYD PLAN charge is 4.25% for each year of the term, computed on the original unpaid balance.

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Industrial financing available in Canada through Canadian Acceptance Corporation Limited

How Bullard Man-au-trol turret heads are gang-planed with two

OK single point tools

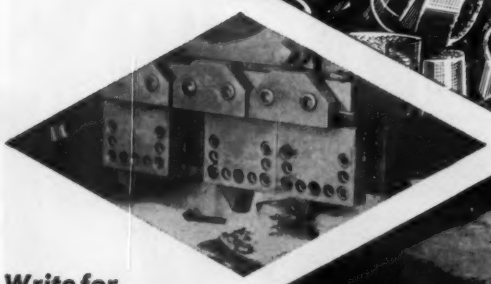
The makers of OK single point tools originated the world's first system of inserted tool bits, preground, ready to use.

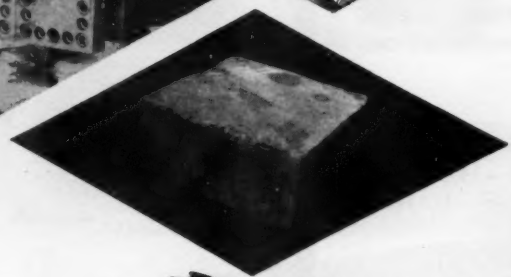
OK single point tools with their interchangeable tool bits were revolutionary when introduced to American industry 50 years ago. Today they are universally used on lathes, shapers, planers and boring mills.

Nine forged billets of 1045 1045 carbon steel, size 20 x 20 x 12" and weighing 1000 lb are anchored [illegible] to the face of a big 48" Giddings and Lewis 35 hp Hypro planer. Two OK shank-type flat-nose tools [illegible] high speed steel tool bits cut an [illegible]° angle on four sides, making a flat pyramid. Chips are heavy 1/16" depth, 3/4" wide. Feed, 40 ft/m.

For the second operation, the blocks are swiveled around and a rugged intermittent cut is made. Carbide could not stand the shock of such a powerful impact. When dull, tool bits are switched, right to left, doubling to life of the bit and continuing production with the minimum of downtime.

OK tools are built for heavy machining. Holders are tough forgings. For tool bits, you have a choice of high speed steel, cobalt, Vasco Supreme and carbide.





Write for OK Tool Catalogs

TWO COMPONENTS— BODY AND BLADES

OK modern milling cutters for modern milling machines

The OK TOOL COMPANY, INC., Milford, New Hampshire

Another advancement by

kaupp

New 19 Inch
Hydroform makes...

large prototype and pre-production parts

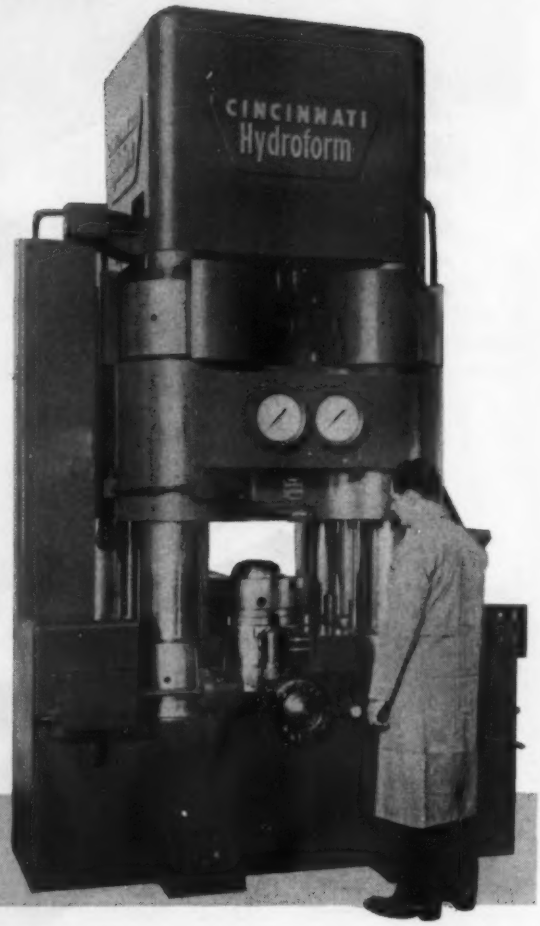
...now available by economical Hydroforming

The new 19" Hydroform is an important addition to Kaupp facilities. This new machine makes it possible to produce larger parts than heretofore possible on the 12" Hydroform previously installed. With both machines now in operation, a vast new field is open for design and development engineers who require prototype components. Your inquiries are invited.

HYDROFORMING BY KAUPP SAVES TIME AND REDUCES TOOL COSTS —

- **Fewer drawing operations**
- **Simple tooling**
- **Fast set-up**
- **Improved quality**

Specify Hydroforming by Kaupp for accurate forming and drawing of stainless steel, Inconel, aluminum, cold rolled steel, copper, brass and other alloys.



NEW 19 INCH HYDROFORMING—WORK CAPACITY:

MAXIMUM BLANK — 19" MAX. PRESSURE — 15,000 P.S.I.
MAX. DRAW DEPTH — 8" MAX. BLANK GAUGE — 3/16" STEEL

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C. B. KAUPP & SONS
NEWARK WAY • MAPLEWOOD • NEW JERSEY

Pattern Makers talk TURCHAN FOLLOWERS

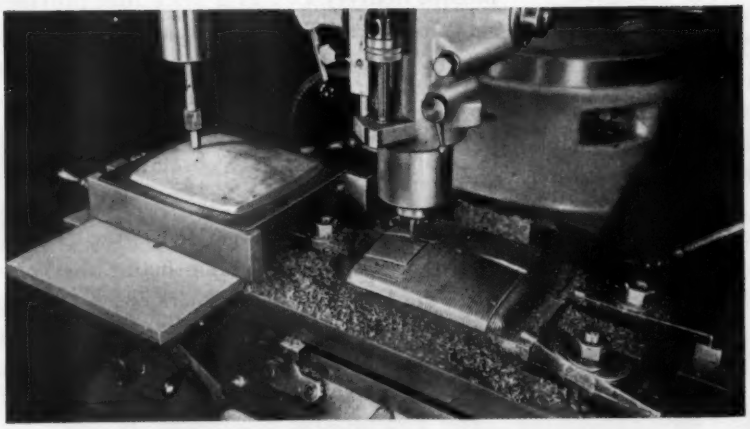
Mr. J. T. Smith and Mr. R. H. Spangler, owners of Annex Pattern Company, study a job.

Battery of vertical mills at Annex Pattern, all equipped with Turchan Hydraulic Duplicators.

Here's what they say about Turchan:

"We find the Turchan Hydraulic Duplicator very efficient, sensitive and accurate in pattern and core making. It is easily attached and simple in operation. The versatile use of the Turchan Follower is invaluable in our custom type work. The most intricate contours and profiles are duplicated with amazing speed and accuracy.

The use of Turchan Follower has resulted in great savings in production costs. These savings far exceed our original investment."



Close-up of the Turchan Follower in action. There is a Turchan Follower to meet every duplicating requirement.

Write today for new TURCHAN folders

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are Standard MALLORY Designs...

And Cost Less!

Just about any resistance welding electrode you may require . . . straight, bent, long, short, irregular . . . you can find in the extensive family of Mallory designs.

There is an almost unlimited selection of Mallory Standard Electrodes which can be made up promptly from existing designs, using available tools. This group includes single-bend and double-bend types which are produced by exclusive Mallory techniques to develop maximum strength and hardness . . . with fluted cooling holes and cooling tubes bent in place.* Also available are many odd shapes for welding in corners, inside channels and in other hard-to-reach spots.

Chances are you can get electrodes from Mallory which fit your application exactly . . . with prompt delivery . . . at a price that provides substantial savings over custom-made designs. All are made to highest standards of precision workmanship, using alloys and methods developed during Mallory's quarter century of leadership in the resistance welding field.

Write today for a copy of the latest Mallory Resistance Welding Catalog listing the complete line of electrodes, holders, seam welding wheels, dies, forgings and castings . . . or get one from your local Mallory welding distributor.

*Patent No. 2,489,993

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Zagar Gearless Drill Heads

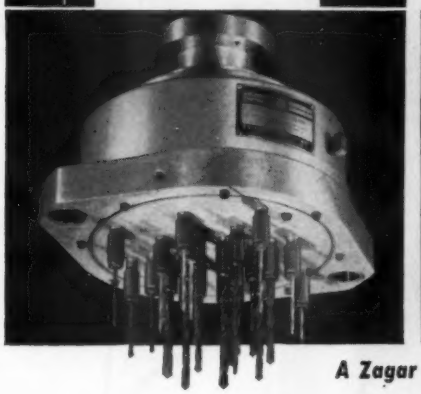
put 4 big advantages to work for you

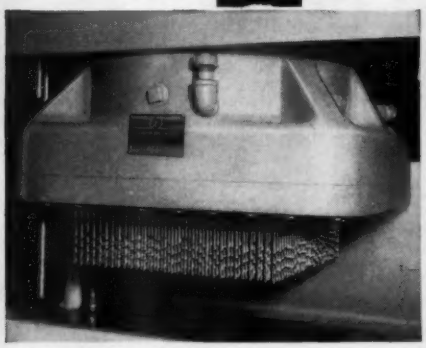
Any number of holes

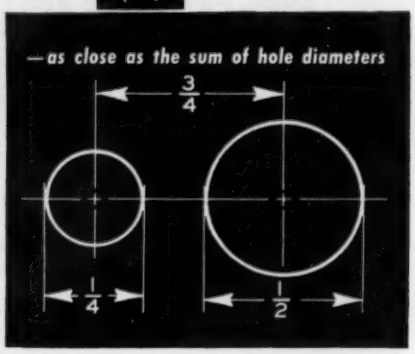
Any hole pattern

Any material

On all centers







A Zagar drill head is never obsolete. Zagar can re-locate spindles for other hole patterns.

Can you visualize the savings made possible by drilling up to 1000 holes at one pass? Zagar standard practice can handle any machinable material up to 1½" diameter. Holes of varying diameters can be drilled to form any pattern. Zagar Gearless Drill Heads, their efficiency proven by many years' success, can be installed on existing drill presses. Or, Zagar will lay out the necessary tooling for your entire job. May we see your sample parts and study your requirements? There is only one *right* answer—one *best* answer—for those requirements. May we supply it?

Let ZAGAR tooling plan the complete job for you

Whether your runs are long or short, let Zagar engineering survey your needs with a view to saving you the cost of special machines. In the case at the right two lines of *standardized* self-clamping drill jigs ream, tap and drill an aluminum die casting, both valve body and cover. The problem of limited production was readily solved. What, sir, are your requirements?

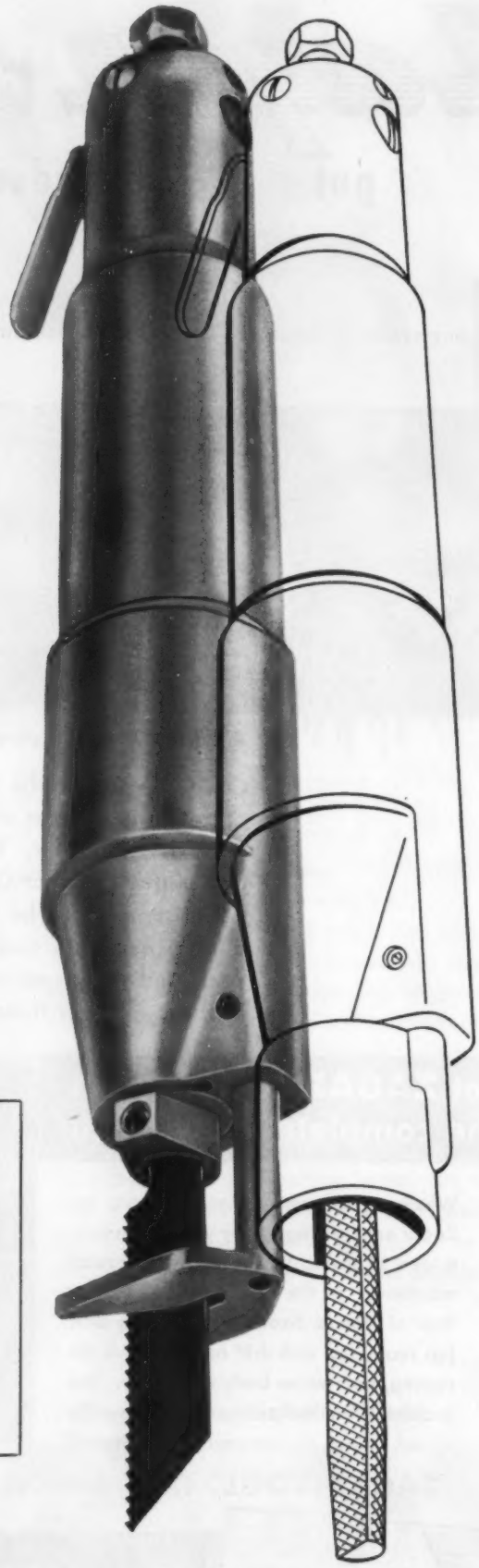
ZAGAR TOOL, INC. 24000 LAKELAND BOULEVARD, CLEVELAND 23, OHIO

Zagar TOOLS FOR INDUSTRY and SPECIAL MACHINERY

Get more information via Zagar's Engineering Manual A-6.

NEW!

the double-duty CP Air Saw



IT CUTS AND FILES . . .

Stainless Steel, Dural Alloys, Nickel, Copper, Aluminum, Iron, Steel, Brass, Plastics, Plexiglass, Fiberglass, Porcelain, Formica, Corrugated Transite Sheeting, Wood, Plywood, Hard Fibre, Wall Board, Masonite.

The CP Air Saw is not an attachment . . . it's a heavy-duty production tool that can take standard blades and files. The Chicago Pneumatic Saw has CONTROLLABLE POWER . . . a built-in speed regulator enables you to select the right speed for every specific work condition. When fitted with the blade collet it can saw practically every material and cut most any possible shape . . . a file chuck can be added to power bench files having round or flat shanks. *Chicago Pneumatic Tool Co., 8 East 44th St., New York 17, N. Y.*

EXAMPLES OF ITS THOUSAND-AND-ONE USES

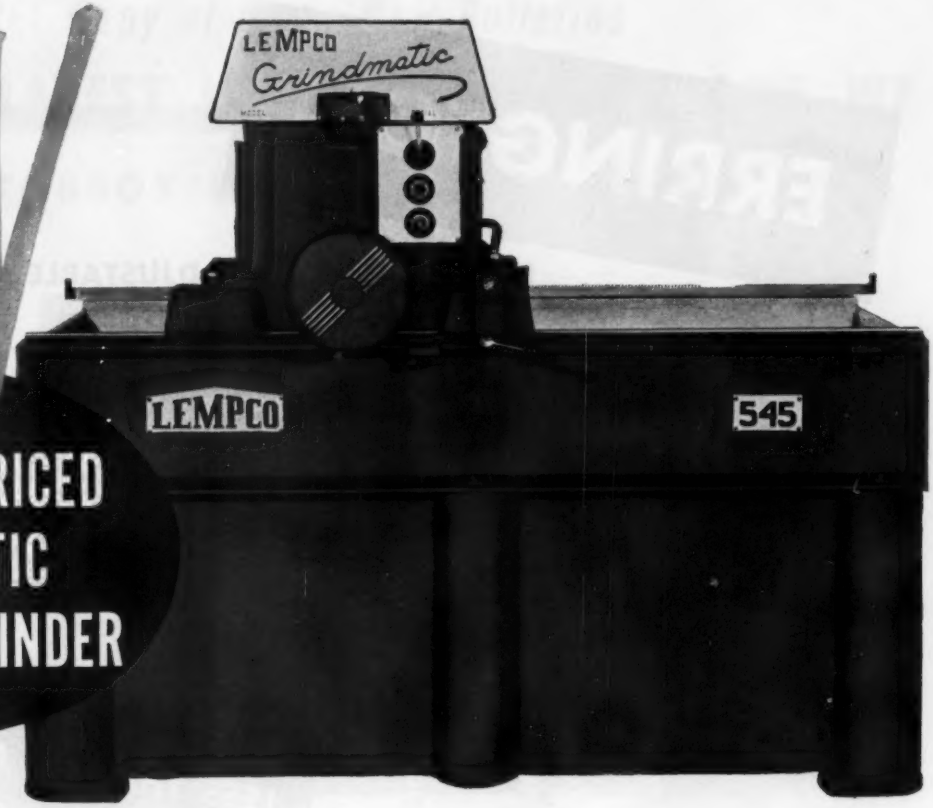
1. **In Receiving and Shipping** — for opening wooden boxes and crates.
2. **In the Shop** — for cutting through thin gauge metal without resulting warpage.
3. **In the Foundry** — for deburring castings.
4. **In the Automotive field** — for installing car heaters, radios and many other "extra" items.
5. **In the Electrical field** — for armature undercutting, cutting coils out of electric motors prior to rewinding, for filing burrs from stator slots in motors and generators.
6. **In Plant Maintenance Departments** — for blind sawing in duct and piping work.

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

NEW

LOW PRICED AUTOMATIC SURFACE GRINDER



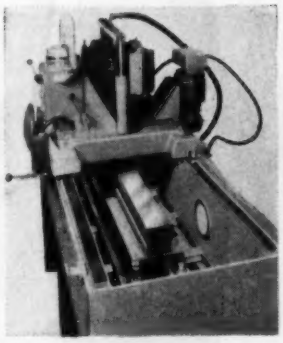
THE *Grindmatic* by LEMPCO

In introducing the Grindmatic, Lempco is actually introducing a new way to make a double reduction in grinding costs.

1. The Grindmatic means a low investment cost . . . *your first savings!*
2. The Grindmatic brings lower production costs . . . *savings that multiply with use.*

The Grindmatic represents the highest value ever offered for your grinding dollar. Designed specifically for industrial grinding applications, it combines fast set up and automatic traverse. Quick feed and positive control of the grinding wheel speeds up operation. Designed for use with conventional holding fixtures or a magnetic chuck offered as optional equipment. Bed arrangement permits inspection for finish and accuracy without removing the work from the machine. This combination of features reduces handling and cuts grinding time per piece.

If obsolete or low production grinding equipment is robbing you of profit, let Lempco demonstrate the savings you can make with this new, low-priced grinder.



AUTOMATIC TRAVERSE

Length of traverse is set by reversible stops located on the ways. Adjusting stops for desired travel is accomplished quickly and easily. Once the stops are in position, traverse is automatic. Workhead is driven by a separate motor at a constant 45" per minute.

Vertical spindle grinding wheel is counterbalanced by pneumatic cylinders which permits effortless movement. Coolant is supplied from a 50 gallon tank located in the bed of the machine. All controls are grouped for convenient operation.

SPECIFICATIONS:

- Grinding Wheel Speed — 1140 RPM
- Wheel Diameter — 12"
- Work Capacity — 38" long, 11½" wide, max. height 11"
- Bed dimensions — 71" long x 20" wide
- Overall height 65", depth 39", length 74"
- Wheel Motor — 3 h.p.
- Feed Motor — ½ h.p.

LEMPCO INDUSTRIAL, INC.

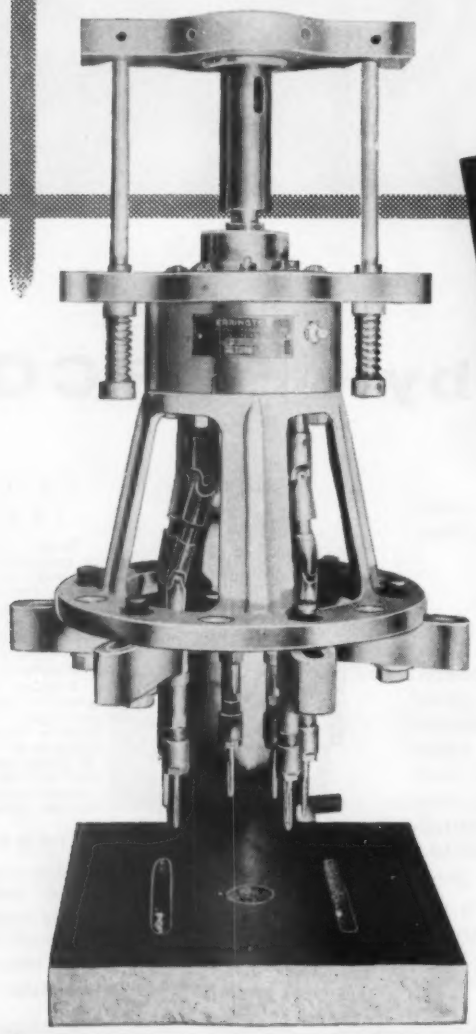
BEDFORD, OHIO

For 35 Years - a Leading Builder of Machine Tools

ERRINGTON

UNIVERSAL JOINT ADJUSTABLE TAPPING & DRILLING HEAD

Here's another hi-speed production tool from Errington. This dependable tool is adjustable to any pattern of holes . . . is available with 4 or 6 spindles. Positive clutch drive and reverse. Head made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. *Remember to do more . . . better . . . faster . . .* rely on Errington Hi-Speed Production Tools.



LESS THAN ½ MINUTE TO CHANGE HEAD FROM DRILLING TO TAPPING OR TAPPING TO DRILLING

#0—0″ to ¼″ Tap Capacity
Min. centers 11/16″
Max. Pattern 5¼″

#1—7/32″ to ½″ Tap Capacity
Min. centers 1½″
Max. Pattern 8″

Send For Complete Information

ERRINGTON MECHANICAL LABORATORY, INC.
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Send for Your FREE Copy of these New Bulletins

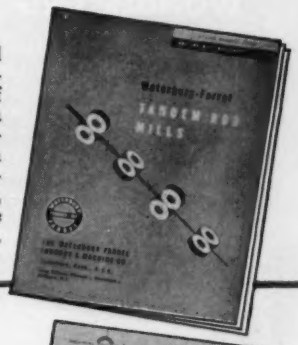
HERE'S THE LATEST INFORMATION ON SOME WF Presses and Rolling Mills

HIGH SPEED BLANKERS—
Cir. No. 915-N-2

Detailed information on 2 sizes of presses for mass production blanking, piercing, shallow drawing and forming. Speed range 300 to 900 rpm. Shows machines from several angles, gives close-ups of design details and pictures typical work samples. Complete specifications included. 8 pages.

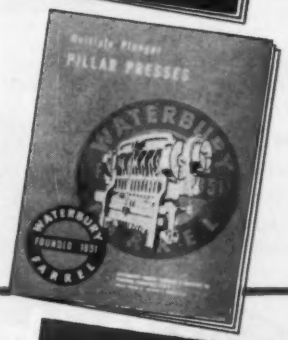
TANDEM ROD MILLS—
Cir. No. 729-R

8-pager on mills for high speed reduction of non-ferrous and ferrous rod. Shows various sizes of mills plus work samples and a cross-sectional reduction sequence. Tells how mill can reduce operating costs. Also discusses pay off unit, straighteners, coilers and cooling method. Table gives capacities and other data.



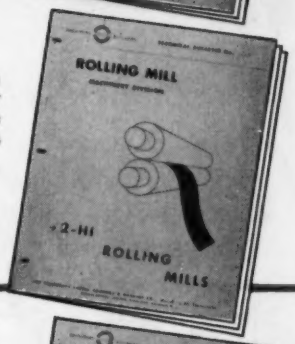
MULTIPLE PLUNGER PILLAR PRESSES—
Cir. No. 754-N-2

8-page illustrated booklet presents latest features in WF multiple station pillar presses. Gives specifications and capacities for six sizes. Shows typical work samples and also covers accessory equipment.



2-HI ROLLING MILLS—
Bul. No. 111-R

Gives general information on wide variety of 2-Hi mills for cold or hot rolling. Rolls range from 5" dia. to 24" dia. Pictures five different sizes.

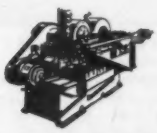


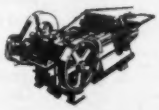
INCLINED, SHELL THREAD ROLLING MACHINE—
Cir. No. 833-EL-2

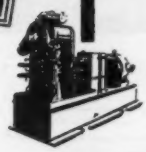
Describes and illustrates automatic inclined shell threader for attachment to eyelet machine or with independent feed. Covers use, construction, operation and drive. Shows work samples and has table of specifications.

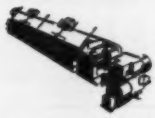
WIRE FLATTENING MILLS—
Bul. No. 110-R

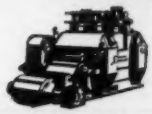
Gives information on mills with production speeds approaching 3,000 FPM. Shows various sizes. Rolls range from 4" dia. to 12" dia. Includes data on edgers, pay-offs, winders, drives, coolant system, etc.


BOLT, NUT & SCREW MACHINERY


POWER PRESSES


ROLLING MILLS


WIRE MILL EQUIPMENT


SENDZIMIR MILLS & OTHER SPECIAL MACHINERY

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☐ 729-R ☐ 111-R ☐ 110-R

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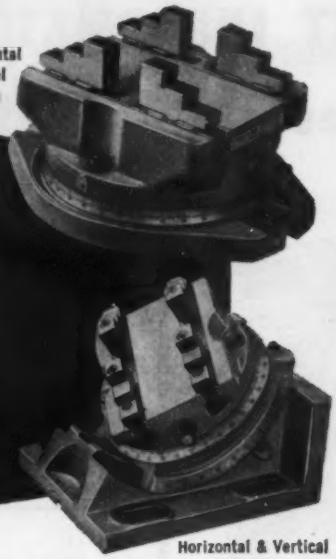
Company.....
Address.....
City..... State.....

MULTI-PURPOSE WONDER GRIP VISES

4 STEPPED JAWS PERMIT CLAMPING of rough castings, irregularly shaped, round, and tapered pieces accurately and quickly, eliminating need for special jigs or fixtures. Narrow stepped jaws allow free access to and measuring of work pieces and provide clearance for cutting tools. Small work pieces machined on three sides without reclamping. Easy and quick to mount and align on any machine. Holds rigid in any position without vibration. Various capacities and extra soft jaws available.



Horizontal Swivel Type

Horizontal & Vertical Swivel Type

TAPPING ATTACHMENTS

Reversible safety tapping attachments with adjustable graduated friction drive, hardened, ground and lapped, complete with torque bar and handles. Precision made throughout by long established reputable West German factory.

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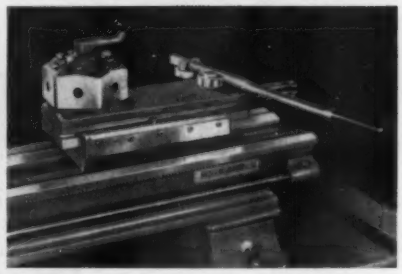
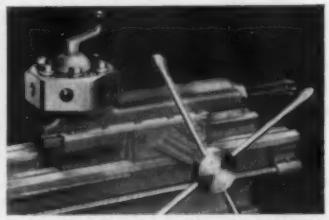


HANDLEVER BED TURRET

Indexes ± .0005" at 4". Superfinished index pin. Automatic indexing and feed stops. Effective slide feed 4".

Size Lathe	Catalog No.	Price
9"	CL1611N	$273.
Light Ten	CL1611K	280.
10"	CL1611R	286.
13"	CL1611T	308.



HAND FEED TURNSTILE BED TURRET

Indexes ± .0005" at 4". Automatic indexing and feed stops. 5⅞" feed.

Size Lathe	Catalog No.	Price
16"	CL1917H	$683.
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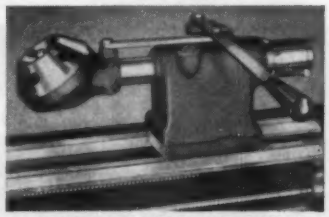
SQUARE TURRET TOOL BLOCK

for Compound Cross Slide

Mounts 4 cutting tools. Turret indexes within .0005" to 4 positions. Quick acting lever lock. For 9" to 16" Lathes — $46 to $91.



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for 9", 10" and 13" Lathes

Priced as low as $116.

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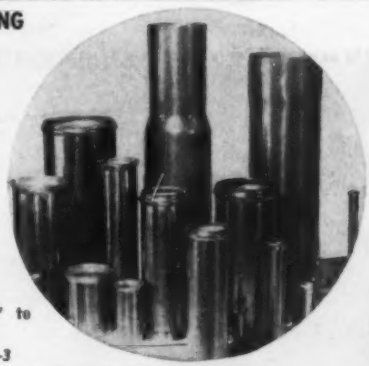
Designers, Equipment Engineers and Production Men are finding it to their advantage . . . in terms of better products at lower cost . . . to use formed-end tubes in their products wherever possible. And they are finding VAILL Machines the economical equipment to use to cut costs and speed such operations as: beading, flaring, expanding, reducing, sinking, swaging, grooving, double-lap flaring and flanging.



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Cross Transfer-Matic performs 555 machining and 133 inspection operations on 100 V-8 cylinder blocks per hour with one operator. Shown here are three of five sections that operate automatically . . . individually or in any combination.

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This mammoth Cross Transfer-Matic uses Vickers Hydraulics exclusively to move cylinder blocks through 688 machining operations and inspections . . . for tool traverse and feed . . . to turn the blocks as needed . . . to clamp and unclamp, etc.

In addition to the advantages inherent in hydraulic control, Vickers Hydraulics gives you the benefits of a nation-wide and full-time field engineering and service organization to assure correct application and operation with least maintenance. Highly efficient Vickers Pumps reduce power costs.

The Vickers Application Engineer near you will be glad to show you the benefits you can obtain by using Vickers Hydraulics. Write for a copy of Bulletin 5002-A.

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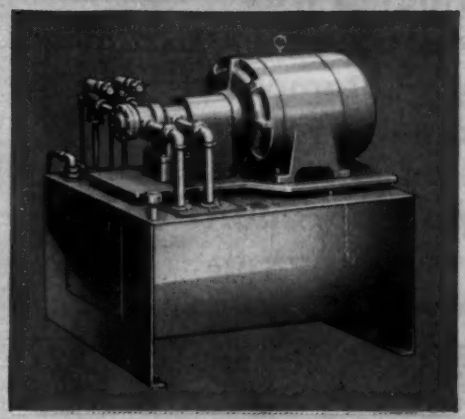

One of 60 Vickers Hydraulic Power Units used on this Cross Transfer-Matic. Some are standard units while others are custom-built by Vickers. Each is a complete "package" for an individual hydraulic circuit; it includes the necessary pumps, valves, oil reservoir, electric motor and controls, as well as all hydraulic accessories (oil filter, air cleaner, oil level gauge, etc.). The result is design simplification and savings in installation and maintenance costs.

7054

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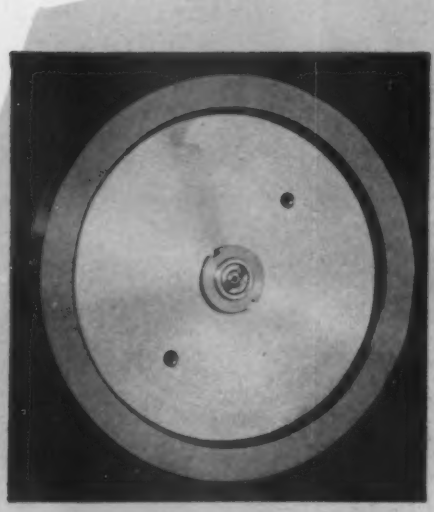

100% more pieces per grind
300% less tools required per job
400% savings in monthly tool cost

the superiority of ELOX electrical discharge grinding was proved by this large automotive company's unsolicited 2-month comparison report!**

Tool Name, Description:	Solid Carbide Insert	
Part Name:	Crankshaft	
Operation Name:	Finish Front & Rear Thrust Bearings	
	Standard Grind	Elox EDM Grind
TOTAL PIECES PER TOOL	17,290	95,904
MINUTES PER GRIND	21.0	13.75
COST PER GRIND	$ 1.26	$ .83
ESTIMATED MONTHLY TOOL COST	$294.71	$92.19

in writing Elox will guarantee increased tool productivity over any type of abrasive grinding.

Other Elox equipment available to remove broken taps, drills, etc., from $495 to $3450.

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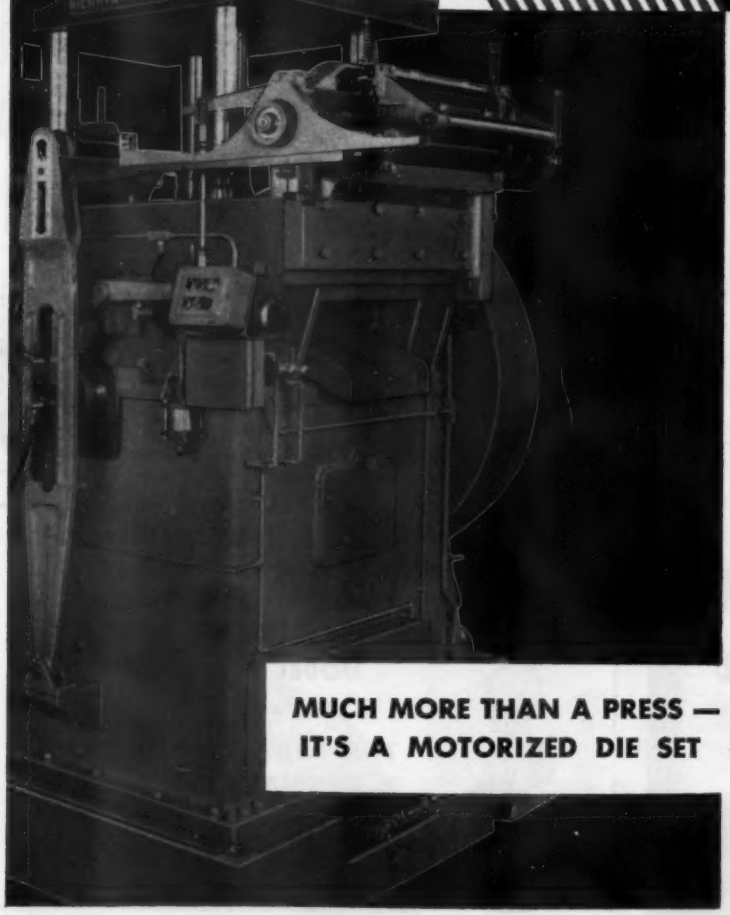

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Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

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Capacities to 1½"
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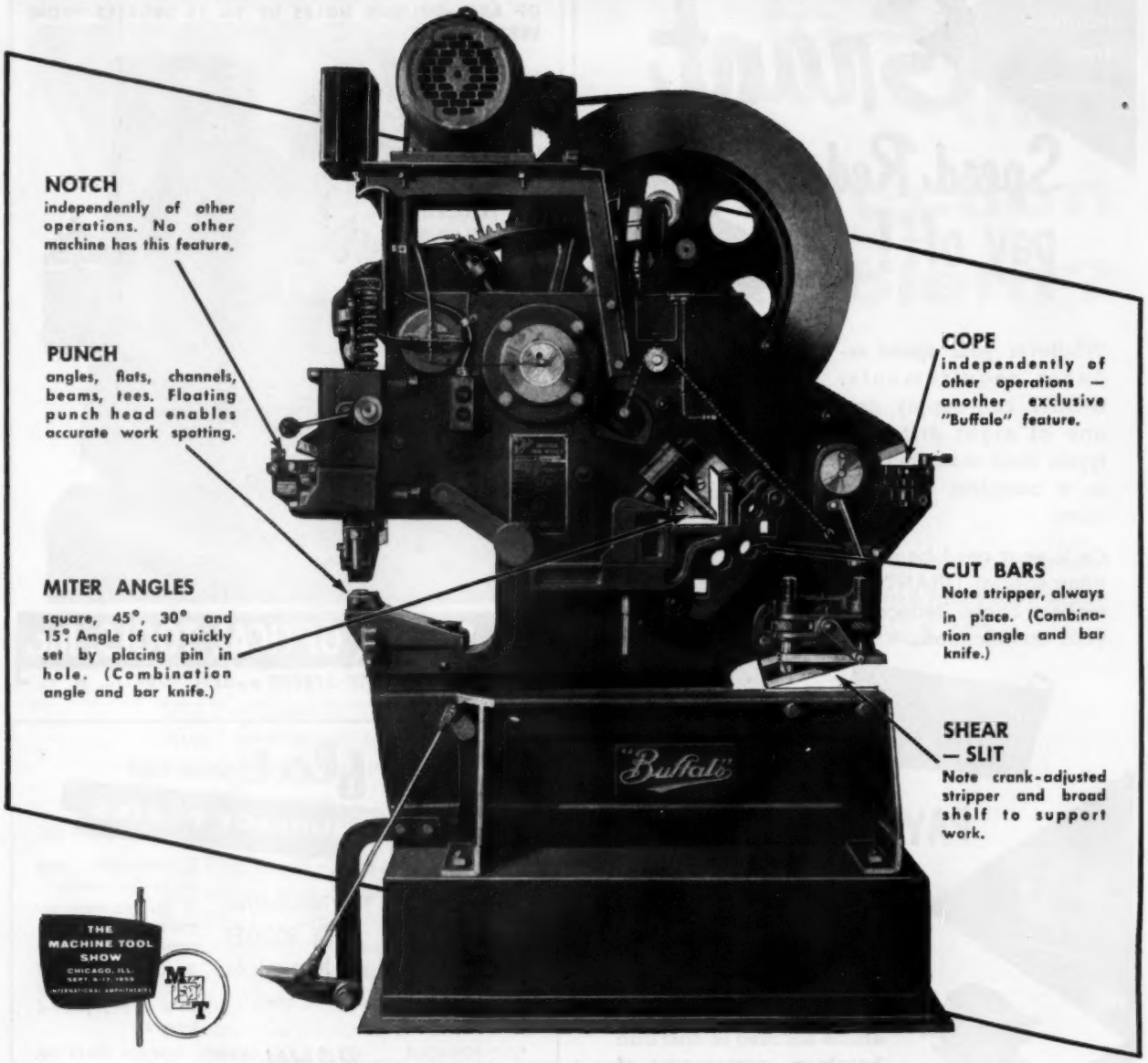
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independently of other operations. No other machine has this feature.
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angles, flats, channels, beams, tees. Floating punch head enables accurate work spotting.
MITER ANGLES
square, 45°, 30° and 15°. Angle of cut quickly set by placing pin in hole. (Combination angle and bar knife.)
COPE
independently of other operations — another exclusive "Buffalo" feature.
CUT BARS
Note stripper, always in place. (Combination angle and bar knife.)
SHEAR — SLIT
Note crank-adjusted stripper and broad shelf to support work.
"Buffalo"
THE MACHINE TOOL SHOW
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THIS "BUFFALO" UNIVERSAL IRON WORKER CAN DO 5 JOBS WHILE YOU READ THIS AD!

Yes, the "Buffalo" Universal Iron Worker is a whole shopful of fabrication tools, all in one compact, powerful machine. Think of the time and floor space this saves in a shop. "Buffalo" Universal Iron Workers are making a big difference in output and profits in hundreds of plants.

Also, the choice of models include such exclusive features as independent built-in notcher and coper—instant miter setting—extra-wide stripper bars—all features that constitute the "Q" Factor* in every "Buffalo" product. Write today for Bulletin 360 and see what this machine could be doing for you!

**The "Q" Factor—the built-in Quality which provides trouble-free satisfaction and long life.*

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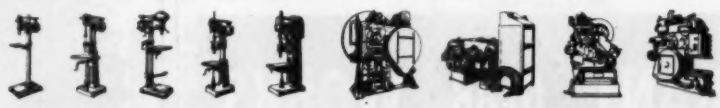

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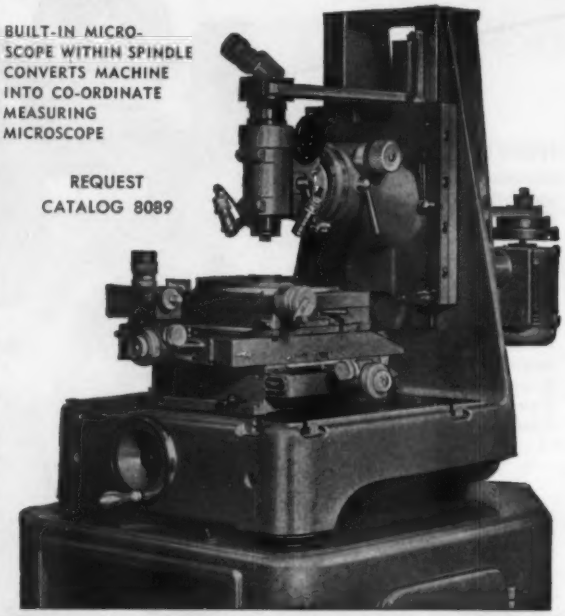

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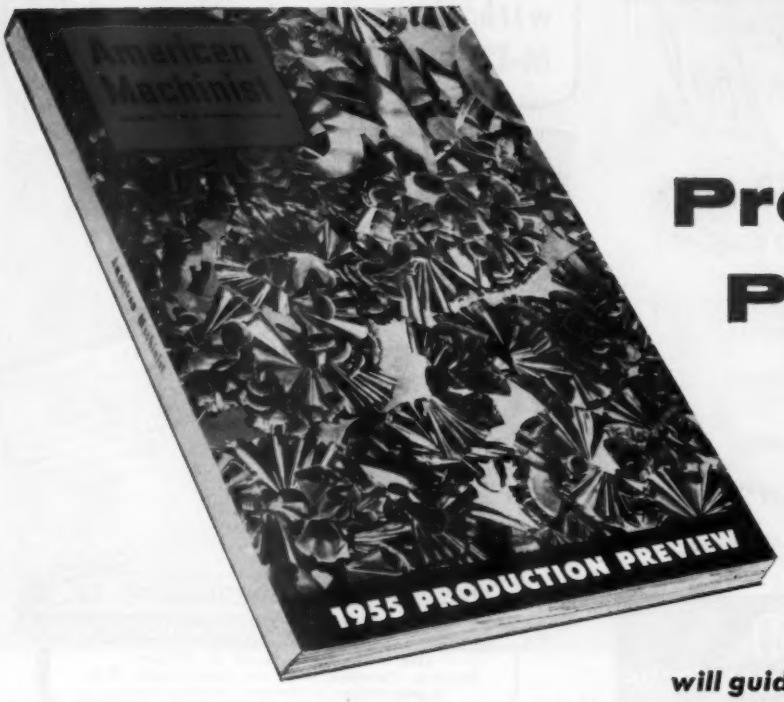
Need New Equipment to Solve that Production Problem?



This 42nd Annual Production PREVIEW Issue will guide you to over 2,400 answers.

When you have a buying problem, look again in your copy of the 1955 Production PREVIEW issue (published January 31). It's a real record-breaker, containing over 25% more descriptions of new machinery, materials, and other production necessities than the 1954 issue.

No other metalworking magazine, even in a full year's issues, provides you with half as many new-product descriptions and illustrations as this PREVIEW offers all in one place. To make your selection easier, our editors screened this issue's 2,400 product descriptions from announcements totalling four times that number . . . to bring you Metalworking's most useful guide to the best available metalworking production equipment and accessories. Complementing this treasure of *what-to-do-it-with* data are the informative advertisements of hundreds of manufacturers with whom you can most profitably do business.

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Complete stock, all sizes #7/0 through #14.
Special sizes to order.
Milled or Centerless Ground (Precision Type).
Made to accurate tolerances.

Also "Stanho" Taper Pins made from selected screw stock, Monel, Brass, Aluminum or other metals. Clean bright finish —prompt shipments.

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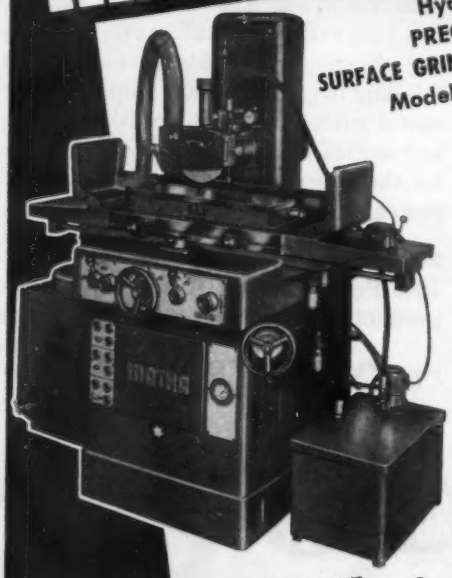
Hydraulic PRECISION SURFACE GRINDING MACHINE Model MF 6



for grinding of:
horizontal and vertical surfaces, slots, keyways, guideways, forms, devices etc.

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"WE CUT PRODUCTION COSTS WITH THE SURFINDICATOR*!"

PRODUCING PRECISION PARTS is a requirement at Hydraulic Press Manufacturing Company, Mount Gilead, Ohio. Thus, the company uses the Brush SURFINDICATOR to check surface finish on pumps, presses, valves, and cylinder parts. A regular inspection tool, the SURFINDICATOR is used 20 to 50 times a day.

HPM reports, "dollar savings in production resulting from use of the SURFINDICATOR." Inspection is speedy, accurate, definite. The human factor in estimating surface finish is eliminated.

The SURFINDICATOR, priced from $685, is an invaluable inspection tool for any plant that must produce parts to specified finishes. You can meet specifications exactly—eliminate costly over-finishing, end guesswork. Let a Brush representative demonstrate the SURFINDICATOR in your plant—no obligation.

*Trade-Mark

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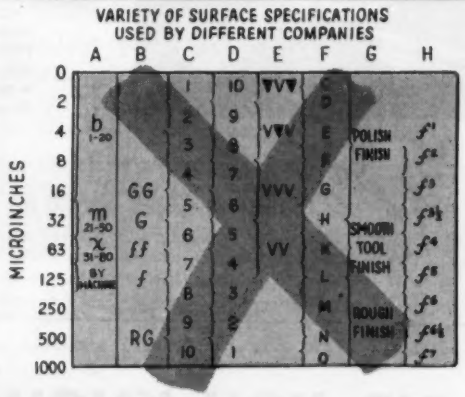
VARIETY OF SURFACE SPECIFICATIONS USED BY DIFFERENT COMPANIES



New Standard Eliminates Confusion in Surface Specifications

These individual methods of specifying surface finish can now be replaced by one uniform system with the new ASA and MIL-10 Standard. The Brush SURFINDICATOR is the only instrument completely meeting the new Standard.

Brush Electronics Company, Dept. U-6
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☐ Please send booklet describing New ASA Standard B46.1, and illustrating SURFINDICATOR.
☐ Have your representative call.

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Company _____

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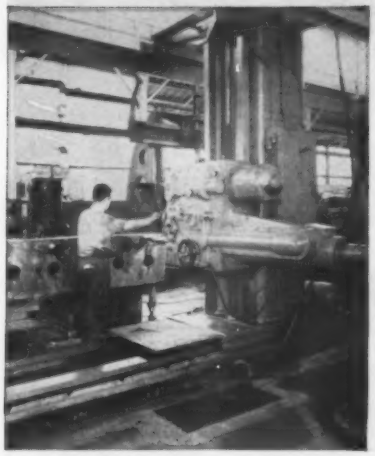
Horizontal Drilling Machines by Kaukauna AT WORK....



Performing quick, accurate drilling operations on press frame parts—drilling, fixture boring, tapping operations on milling machine columns—drilling all four parts of a tractor frame on a repetitive production line basis—these are the types of jobs illustrated, showing Kaukauna Horizontal Drilling Machines at work. The time and labor savings are of course apparent—elimination of expensive crane lifts, reduction in handling time, inexpensive tooling.

As illustrated, there is a Kaukauna Horizontal Drilling Machine in a size suitable for any class of work from small, high production jobs to extremely large work pieces. These extremely versatile machines make for greater work simplification and may be used to advantage in your shop for driving boring fixtures, drilling, reaming, boring, counterboring, tapping and spot-facing operations.

Kaukauna builds Universal Radial Drills and Horizontal Drilling Machines in a range of sizes which meet practically all requirements in modern production practice. Write today for descriptive catalog or ask representative to call.

KMC Kaukauna MACHINE CORPORATION
KAUKAUNA, WISCONSIN, U. S. A.

DID YOU KNOW

. . . that you will find more advertising for machine tools in *American Machinist* than appears in any other magazine in the world?

All of it will guide you to the best in modern machining methods and equipment. You spend time well when you spend it in the pages of *American Machinist*.

a report on METALWORKING OPPORTUNITIES in Manitoba, Canada

from a recently completed impartial survey*

Products and subgroups of the metalworking industry which offer opportunities to Manitoba producers include: cutlery, copper and brass products, hand and power tools, hardware and fittings, metal fastenings, athletic and sporting equipment, metal containers, instruments, jewelry and silverware, oil well equipment, household goods and appliances, sheetmetal products, castings and forgings, electrical machinery and equipment, industrial equipment and parts, office equipment, farm and construction equipment and supporting industries.

Manitoba's central location in the Prairie region of Canada makes it an excellent manufacturing and distribution centre for the Prairie Provinces and Western Ontario. Low-weight, high-value items can also be economically distributed to the national and export markets.

**Name of the research company with a copy of its report will be mailed on request to interested and responsible parties.*

MANITOBA DEPARTMENT OF INDUSTRY AND COMMERCE

Dept. AM, Legislative Building
Winnipeg, Canada

ERCO's NEW SHRINKER & STRETCHER . . .

MODEL #187

. . . provides 50% greater capacity!

Soon available for delivery, ERCO's new foot-operated Shrinker & Stretcher is a great improvement over earlier ERCO models. This machine has 50% greater capacity . . . is easier to operate . . . handles all material thicknesses with maximum mechanical advantage . . . lengthens tool life.

CAPACITIES

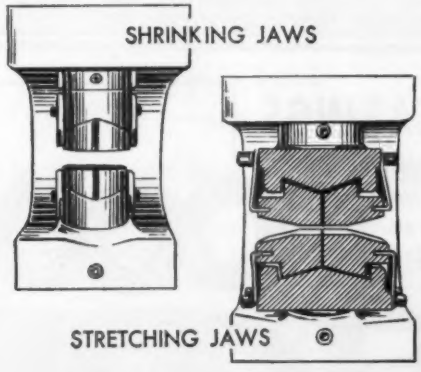
MATERIAL	THICKNESS	STRIP WIDTH
Mild Steel	3/16"	1½"
24S-T6 Aluminum	5/32"	1½"
Stainless Steel (100,000 psi)	.125	1"
Titanium (100,000 psi)	.109	1"

WHAT DOES ERCO's SHRINKER & STRETCHER DO?
It decreases or increases the length of metals in localized areas and obtains results impossible with other metal working tools. This foot-operated model, requiring little floor space, is used for:

a. forming contours on angles and flat strips without using presses and expensive dies for small runs;

b. straightening warped angles and flats;

c. removing flange wrinkles and warpage from pressformed parts.



The new style shrinking and stretching jaws perfected by ERCO offer you important advantages:

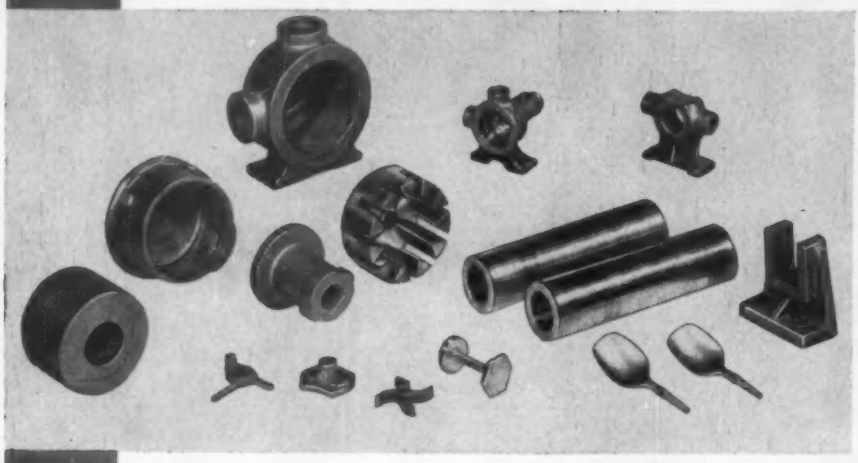
Greater work area . . . less work marking . . . automatic adjustment to the shrinking action.

In brief: more capacity, less effort!

For complete information, write:

ENGINEERING and RESEARCH
A DIVISION OF acf INDUSTRIES INCORPORATED
RIVERDALE, MARYLAND

Have all your stainless steel castings made to order by the *Vollrath Co.*



THE skill and experience of 81 years of foundry, finishing and metal-working operations go to work for you when you call on Vollrath. Complete, modern foundry facilities assure dependable delivery of all types of quality stainless steel castings — as well as grey iron and non-ferrous castings of aluminum, aluminum alloys, brass and bronze. Shown here are just a few of the many stainless steel castings that can be produced by Vollrath . . . *faster and for less than it costs to make them in your own plant.*

A variety of stamping and forming operations are also available. Write today for complete information on castings, including stainless steel sleeves and bushings made to any size and dimension.

Vollrath is FIRST . . . in steel utensils — stainless steel and porcelain enameled steel . . . in cast stainless steel and aluminum boat hardware. Also manufacturers of Vollrath rotary power lawn mowers and home workshop tools.

Contract Sales Division

THE VOLLRATH CO., SHEBOYGAN, WISCONSIN

Slash Production Costs with High Speed

40 Years of Know-How . . . Yours for the Asking

ASSEMBLY PROBLEMS? Let High Speed's experience and know-how help you find the solutions. Unique tooling and engineering service available without cost. Send sample assemblies with loose pins, studs, rivets, etc. and/or prints. We'll quickly return complete analysis. It's that simple. Write or call today!

AUTOMATIC STAKING MACHINES AND RIVETING HAMMERS

Wide range of Bench and Pedestal Models—motor, foot and air operated. Send for catalogs.

Phone COngress 6470 TODAY!

HIGH SPEED HAMMER CO., INC.
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DO YOU BEND PIPE, TUBE, BARS, ANGLES, ETC?

"The Cold Bending of Metals" book is an invaluable aid. A 48 page book with 43 illustrations. Chapters on . . . Theory of cold bending . . . making a bend . . . bending on rotary bender . . . bending on a ram bender . . . tools for bending . . . hydraulic circuits . . . and others.

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LUERS

Patented Cutting Off Tool Holders
Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
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B & RB PRECISION BEARINGS

Are selected for dependability, longer life and greater capacity. Standard sizes are carried in stock. *Write for our general catalog No. 19.*

THE BALL AND ROLLER BEARING CO.
DANBURY, CONNECTICUT

FOR "SPECIAL" CUTTERS AT STANDARD PRICES!

CHECK THE NELCO CATALOG!

NEARLY 800 DIFFERENT NELCO TOOLS ARE REGULARLY STOCKED TO FILL 90% OF *ALL SPECIAL TOOL APPLICATIONS!*

Before ordering costly *special* cutters, investigate NELCO — chances are the tool to do the job is waiting — without delay! Without extra cost! There are, for example, 47 *Standard* Series 300 Nelco Side Milling Cutters for working cast iron, brass and bronze. 6 teeth to 24 teeth — diameters from 3" to 12" — teeth graduated from 3/32" to 1" in width — from 1" to 2" hole diameter. Throughout the entire Nelco line, this same versatility and utility holds true. Other *standard* Nelco carbide tools in stock — saving dollars on special cutters — include

130 Different Side Milling Cutters
37 Different Slitting Saws
171 Different End Mills
21 Different Slab Milling Cutters
40 Different Face Milling Cutters
25 Different Shell End Mills
189 Different Carbide Tipped Drills

. . . and scores of additional cutters for every application.

SEND TODAY FOR THE NEW NELCO 48 PAGE CATALOG — Whatever your tooling requirements may be — refer to this comprehensive catalog — the tool to do the job is probably stocked by Nelco.

NELCO TOOLS

FACE MILLS
•
SLAB MILLS
•
BORING BARS
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SPECIAL TOOLS
•
SLITTING SAWS
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HALF SIDE MILLS
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KEYSEAT CUTTERS
•
DIAMOND WHEELS
•
SHELL END MILLS
•
TRI-HELIX FACE MILLS
•
HARDENED STEEL DRILLS
•
FINE PITCH FACE MILLS
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SOLID CARBIDE REAMERS
•
CARBIDE TIPPED TAPER SHANK CHUCKING REAMERS
•
CARBIDE TIPPED STRAIGHT SHANK CHUCKING REAMERS
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2 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
4 FLUTE DOUBLE END SOLID CARBIDE END MILLS
•
3 FLUTE CARBIDE TIPPED CENTER CUTTING END MILLS
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SOLID CARBIDE TWIST DRILLS
•
No. 50 TAPER SHANK END MILLS
•
INSERTED BLADE FACE MILLS
•
GRINDER AND LATHE CENTERS
•
CARBIDE TIPPED TWIST DRILLS
•
TRI-HELIX SIDE MILLING CUTTERS
•
2 FLUTE CARBIDE TIPPED END MILLS
•
2 FLUTE SOLID CARBIDE END MILLS
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3 FLUTE CARBIDE TIPPED END MILLS
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4 FLUTE CARBIDE TIPPED END MILLS
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TYPE C SHELL MILLING CUTTER ARBORS

NELCO TOOLS

For that EXTRA Edge in Production!

NELCO TOOL CO., Inc. • Manchester, Connecticut

MODERN CUTTING - OFF MACHINE

Cuts off longer pieces than regular automatic machines—*any length you want.* FAST cutting and chamfering of tubing, pipe, shafting. Check the following figures:

½" Tubing — Cuts and Chamfers both outside edges of ½" wall tubing, 5" lengths, every 2.5 seconds.

1¼" Cold Rolled — Cuts and Chamfers both ends, 20" long, at rate of 1 every 20 seconds.

1" Tubing — Cuts and Chamfers both outside edges, pieces 3" long. One every 3 seconds.

These popular, time saving machines are now available in four sizes, handling work up to 6¾" O.D. Their many cost cutting features are described and illustrated in our latest catalog that will be mailed promptly on request.

WRITE FOR ILLUSTRATED CATALOG

MODERN MACHINE TOOL CO.

2005 LOSEY ST. JACKSON, MICHIGAN

M&M giant keyseaters

M & M Giant Keyseaters cut internal keyways or splines in the bores of pulleys, gears, flywheels and other machine parts. Fast, accurate operation. Built in a wide range of sizes. Special fixtures and cutters available for unusual shapes and taper work. Write today for complete information.

MITTS & MERRILL

104 Holden Street • SAGINAW, MICHIGAN

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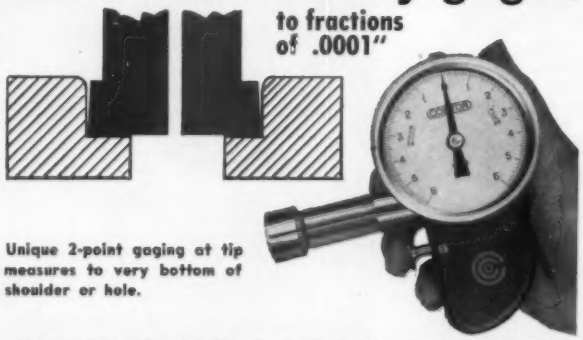
COUNTERBORES and BLIND HOLES now easily gaged

to fractions of .0001"



Unique 2-point gaging at tip measures to very bottom of shoulder or hole.

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from ⅛" to 8" dia.

Unique Advantages

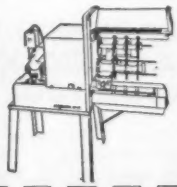
- Positive gaging accuracy to fraction of .0001" regardless of who operates it.
- Indicates actual size, a fixed—not passing—reading.
- Positive 2-point gaging—automatic centering.
- Shallow holes, deep holes, inside splines, open-end holes gaged easily.
- Detects ovality, back or front taper, bell mouth, barrel shape.
- Reaches to bottom of blind holes.
- Gages work while still held in chuck.
- A shop tool for all-day every day use.
- Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, automotive transmission, household appliance, farm machinery, guided missile and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

COMTOR COMPANY

68 Farwell St.
WALTHAM 54, MASS.

GET THE FACTS—REQUEST BULLETIN 48

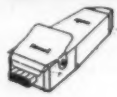


HERCULES HOLDERS AND TYPE

FOR STAMPING NUMBERS INTO STEEL AND OTHER METALS.

● We make the most complete line of Marking equipment in America.

WELDING ROD MARKING MACHINES



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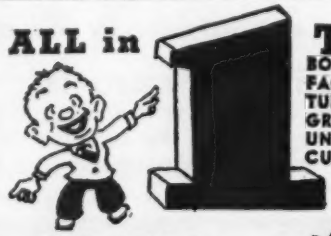
CENTERING MACHINES

● HAND ● SEMI-AUTOMATIC ● AUTOMATIC

Special Machinery

HEBERT Equipment Co. • Romeo, Mich.



ALL in Toolhead

BORING
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Write today for complete details.

CHANDLER TOOL CO.
Muncie, Indiana

A Model for Any Size Machine

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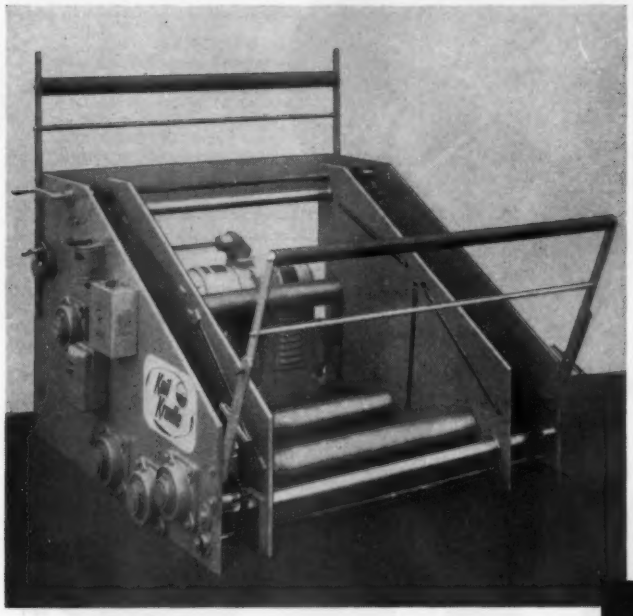
•A Boring Head that Won't Face Is Not Complete

COMBINED BORING & FACING TOOL HEADS
Chandler-Duplex

NEW 7000 lb. Koil-Kradle



feeds 40" stock from 42" rolls

benchmaster

now supplies all KOIL-KRADLE requirements, standard or special, from ½ ton to 8 tons capacity.

OPERATES INTERMITTENTLY using Vari-loop Control to sustain a slack loop from which any machine can draw.

OPERATES CONTINUOUSLY at any constant speed within range of variable-speed driving unit.

DUAL GUIDE PLATES quickly adjust for any stock width up to 40".

ALL ROLLS HARDENED. Power driven rolls mounted in self-aligning bearings.

There's only one KOIL KRADLE! Write for quotations on your coil-feeding requirements.

1835 West Rosecrans Avenue, Gardena, California

benchmaster

World's largest manufacturer of small punch presses and mills.

ATTENTION

Machine Tool Repairmen

The new power Scraping tool, Flex; shaft driven, light, portable, Rough scraping fast, closing in bearing to 15 spots per ins.

- **Feathering finished work, as per hand scraping.**
- **50% saving in time and effort.**

Ask for demonstration in your shop

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Phone RE 9-3972

Boost Shop Efficiency

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• For Machine Shops

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Up-to-date one-volume source for all tested, detailed standard data needed for establishing machine shop time values. Provides separate tables for each common type of machine tool.

Specifications recognize such variables as weight of piece, transportation, etc. Recommendations for machining and tables for machine elements based on type of equipment, amount of material to be removed, etc.

87 forms, tables. 473 pp. $10

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Send me ..... copies of *Hadden* and *Genger's* **Handbook of Standard Time Data** at $10. per copy.

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THE RONALD PRESS COMPANY
15 E. 26th St., New York 10

FAMOUS LAST WORDS:

"it may never happen"

True—and let's hope it never does. But the moment when we're least expecting it would be the best moment for an aggressor to attack. And the atom bomb isn't the only emergency that may hit us. Fires, floods, explosions, tornadoes also strike with little or no warning. Be ready for disaster, whatever form it takes. Do these simple things TODAY:

- ☐ **Enlist the help of your local Civil Defense Director.**
- ☐ **Check contents and locations of first-aid kits.**
- ☐ **Send staff to Red Cross courses. They may save your life.**
- ☐ **Promote preparedness in your community. Your local CD Director can show you how.**

Set the standard of preparedness in your plant city—check off these four simple points NOW.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not Available for Equipment Advertising.)

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count 1 line additional.

POSITION WANTED undisplayed rate is one-half of above, payable in advance.

INFORMATION

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

EMPLOYMENT ADVERTISING: New Employment Opportunities Section for Displayed ads starting July 4th issue. For details see announcement ad in this section.

DISPLAYED RATE

The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns —30 inches to a page. A. M.

NEW ADVERTISEMENTS Address N.Y. Office, 330 W. 42 St., N.Y., for June 20th issue closing June 6th.

OPPORTUNITIES FOR ENGINEERS IN THE INDUSTRIAL ADVERTISING AND TECHNICAL WRITING FIELD

Are today almost unlimited. If you are under 35 years old, like to write, have a technical background, and want a career in industrial advertising, we have an opening for you that offers big opportunities. Ability to write and salesmindedness are essential. Write to us. We will give you more details.

P-6562, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

NEW YORK: 330 W. 42 St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

Manufacturers' Agents wanted. Several territories available for well-known McCaskey Control systems: tool crib and gage control, production, maintenance and inventory controls, equipment, multicopy forms etc. Full details of potential sales, repeat business etc., on receipt of complete resume your experience, accounts and territory. McCaskey Industrial Div., Victor Adding Machine Co., 3900 North Rockwell St., Chicago 18, Ill.

EMPLOYMENT SERVICE

Salaried Positions, $5,000 to $35,000. We offer the original personal employment service (established 45 years.) Procedure of highest ethical standard is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 652 Brisbane Bldg., Buffalo 3, N. Y.

ATTENTION . . .

EMPLOYMENT ADVERTISERS

Effective with the July 4th issue, a new section will start in American Machinist. We will head this section: EMPLOYMENT OPPORTUNITIES. All Displayed Employment Opportunity advertising will be placed in this new section, with the exception of those advertisers who contract for run-of-book position. New advertisements will be billed at the transient rate of $16.65 per inch unless on contract. Contract rates furnished on request. Ads are subject to Agency Commission.

WANTED
MACHINE TOOL DISTRIBUTORS

Exclusive territories open throughout the United States, Canada, and Mexico for leading European manufacturers of the following machine tools:

Turret Lathes
Vertical Slotting Machines
Diamond Turning Machines
Vertical Millers
Keyway Automatic Millers
Internal Grinders
Tool-Cutter Grinders
Automatic Trimming and Thread Spinning Machines

Inquiries should be addressed to:

R.W. 6151 AMERICAN MACHINIST
330 W. 42 St. New York 36, N. Y.

ADVERTISING CAREER OPPORTUNITY IN INDUSTRY

Position with a future opportunity in our Advertising Department for a young man with proved mechanical aptitude and copy writing ability. Will work creatively with all media on a wide variety of highly technical products. Engineering degree or at least two years metal working shop experience desirable. Starting salary $4800. We are large well-known manufacturer located in southern New England. National advertiser. Please write fully and in confidence to

P-6575, AMERICAN MACHINIST
330 W. 42nd St., New York 36, N. Y.

CHIEF ENGINEER

Excellent opportunity for a talented M.E. with a background in Tooling. Duties include supervision of Tooling, Experimental and Project Engineering.

Progressive, medium sizes firm with stamping and assembly facilities.

Good starting salary and opportunity for growth and promotion.

All replies confidential.

P-6612, AMERICAN MACHINIST
1111 Wilshire Blvd., Los Angeles 17, Calif.

Useful for Design, Shop & Inspection Work

MACHINE TOOL RECONDITIONING & the Art of Hand Scraping

Write for folder describing illustrated book

MACHINE TOOL PUBLICATIONS
215 Commerce Bldg., Fourth & Wabash Sts.
St. Paul 1, Minn.

BEDROOM FURNITURE MANUFACTURING CO. in Los Angeles, Calif. Mfgs finished & unfinished hardwood furniture of xlnt quality in the higher priced lines. Estblshd 1946. Good profits. Property 80' x 135'. 3 yr old bldg. with 5000 sq ft of space; 2 five room homes. Full equipped. Exceptional offer priced at real asset value only. Inquire for details Dept. 21936.

FILM EQUIPMENT MFGR. CO. So. Calif. Nets $24,400 yr. Mfgr. film holders. Nationally advertised, internationally distributed. Little competition. F.P.: $40,000. Dept. #X21903.

METAL ART STUDIO—STORE BUILDING—APARTMENT, Los Angeles area. No competition. Xlnt. reputation. Mn. blvd. loc. R.E. incl. Priced to sell. #21847.

NOVELTY & SOUVENIR MFG. CO., Denver, Colo. area. Mfgrs. unique plaster figures, shadow boxes, ceramic figurines, etc. Many back orders. Ill health forces sale. R.E. opt. Estabi. Clientele. Low priced . . . Terms. Dept. 21908-A.

PATTERN WORKS, San Francisco, Calif area. Estab. 1931. Well-known. Xlnt. reputation. Choice ind. loc. Nets over $4,000 yr. Priced to sell #X21859.

POWER MOWER MANUFACTURING & SALES in West Florida. Exclusive mfg of patented rotary power mower, invented 1928 with steadily increasing sales; could expand nation-wide. Xlnt commercial location 80' x 127', main bldg 50' x 120'. Valuable equipment list. Low price at value of real assets only. Very good potential. Inquire for details. #6362-A.

ROLL-UP SCREENS MANUFACTURING in So. Calif. Near L.A., mfg mdrn window screens. Only 2 competitors in U.S. Dealers thru-out Pacific States & Hawaii. Full eqpd. Needs ambitious buyer to promote great existing potential. Dept. X21928.

CHAS. FORD & ASSOC.
87 Walton St. NW
Atlanta, Georgia

6425 Hollywood Blvd.
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PEACOCK CORPORATION
Propane Gas Installations
and
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Paul E. Peacock, Jr., Pres.
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

Here are a few of the more than 2000 Machines Currently in stock . . .

TOOL & CUTTER GRINDERS

Gisholt Universal Tool Grinder, belt
Type 05D Sellers Drill Grinder, m.d.
No. 0-2GP Sellers Drill Point Thinning Machine, m.d.
Grand Rapids Tap Grinder, style 12M
No. 2A Wm. Sellers Universal Tool Grinder, m.d.
No. 2B Sellers Wet Grinder, m.d.
No. 2 Lumsden Oscillating Tool Grinder, belted m.d.
No. 4T Sellers Tool, m.d., latest
No. 5T Sellels Tool, m.d.
No. 13 Gleason Cutter Sharpener, m.d., late
Ingersoll Face Mill Grinder
12x28" Landis Universal & Tool Grinder, m.d., late
#1 Wilmarth & Marmon Tool Grinder

PRESSES

Chambersburg Mounting Press, 220 ton capacity, oil gear unit
100 ton Wood Hydraulic Press, four col., single action
100 ton Chambersburg Hydraulic
600 ton Niles-Bement-Pond Wheel Press, m.d.
No. 62 W.F. Bliss Duplex Press, m.d.
No. 8-S Cleveland Straight Side Single Crank Press, m.d.
Chambersburg 30 ton Hydro-Pneumatic, 13" stroke
No. 6 Verdin, Kappes & Verdin Straight Side Press
No. 306½ Bliss Straight Sided Press, 6" stroke, 165 ton cap.

SAWS

No. 4XB Robertson Economy Saw, m.d., new
No. 4B Robertson Economy Saw, m.d., new
Gustav Wagner Cold Saw, m.d.
Kelle Heavy Duty Steel & Metal Bandsaw, Model BSM-40, new
6x6" Peerless Hack Saw
31A Cochran Bly, latest
No. 3 Metch & Merryweather, 1944
No. 32-B Cochran Bly Saw, m.d., latest

ENGINE LATHES

Gema "Copyter" Duplicating Attachment, m.d.
12"x6' Lodge & Shipley, m.d.
12"x84" centers Lodge & Shipley Geared Head, m.d., taper
13"x48" centers Pratt & Whitney Geared Head, m.d.
13"x60" bed South Bend, m.d., 1942
14"x30" centers Bradford Lathe, Timken
14"x32" centers Cincinnati Geared Head, m.d., late
14"x6' American High Duty Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Pratt & Whitney, cone
14"x8' LeBlond, cone
14"x6' LeBlond Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield, Geared Head, m.d., taper
14"x8' bed American, m.d.
16"x30" centers Cincinnati, m.d.
16"x30" centers Monarch, m.d., taper
16"x54" centers Lodge & Shipley, m.d., 1940
16"x54" centers Monarch, m.d.
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' bed Monarch Geared Head, m.d.
16"x8' Monarch, cone, motorized
17"x6' LeBlond Geared Head, m.d.
18"x40" centers Monarch Geared Head, m.d.
18"x48" centers Lodge & Shipley Geared Head, m.d.
18"x54" centers American High Duty, m.d.
18"x57" centers Monarch Geared Head, m.d.
18"x6' American, 8 speed
18"x5' LeBlond Geared Head, m.d.
18"x54" American, 1940
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, m.d.
18"x10'6" bed Boye & Emmes, cone, motorized
18"x14'6" bed Cincinnati, cone, motorized
19"x8' bed LeBlond Geared Head, Timken, m.d.
19"x10' bed LeBlond Geared Head, m.d.
20"x48" centers Reed-Prentice, Geared Head, m.d.
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"x8' Cisco, cone, motorized
20"x8' bed Lodge & Shipley Geared Head, m.d., taner, late type
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
21"x8' bed LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' LeBlond Geared Head, m.d., taper
24"x12' bed Boye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24" raised to swing 32"x22' bed—16" centers New Haven, cone, taper
25"x10' bed LeBlond Geared Head, m.d., taper
30" raised to swing 44"x15' bed American Geared Head, m.d.
30"x12'6" bed Niles-Bement-Pond variable speed, m.d., taper
36"x84" centers American "Super-Productive", m.d.
36"x18' bed Putnam Geared Head, m.d.
38"x17' centers American Super-Produtcive Geared Head, m.d.
40" raised to 48½x108" centers LeBlond, m.d.
42" Model NN Monarch Geared Head, m.d., late
42"x14' bed American Geared Head, m.d.
42" Putnam raised to swing 56½x20' bed Geared Head, m.d., 11'8" centers
48"x33' centers Niles-Bement-Pond, m.d.
63"x7' centers I. H. Johnson, m.d.
72"x7' centers I. H. Johnson, m.d.

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
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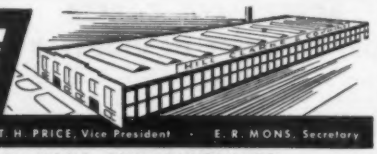
HILL-CLARKE MACHINERY COMPANY



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CONSULT US ABOUT REBUILDING YOUR OWN MACHINES

BORING MACHINE

100" Niles Vert. Bor. Mill

DRILLS

No. 2 Avey Cam Fd.—1 spdl.—15" sw.
No. 2MA6 Avey—1 spdl.—24" sw.
No. 4MS—1 Spdl.—Leland-Gifford
No. 422 Baker—1 Spdl.—24" sw.
No. 2LMS L-G—2 spdl.—20" sw.
No. 3 Avey—2 spdl.—24" sw.
No. 2MS Allen—2 spdl.—24" sw.
No. 2 LMS L-G—4 spdl.—14" sw.
No. 3B Edlund—6 spdl.—30" sw.
No. K60H Fox Multiple

GEAR MACHINES

11" Gleason Gear Generator
No. 36BM Gould & Eberhardt
No. 615A Fellows Gear Shaper
No. 612A Fellows Gear Shaper
No. 05 Fellows, Cone Drive
No. 12HS Gould & Eberhardt

GRINDERS

No. 4H—4"x12" Landis Plain Cyl.
5"x20" Norton Cam-O-Matic
5"x42" Norton Type C Pl.
6"x18" Norton Type C Plain
8"x15" Elgin EB-5C
10"x18" Norton Type C Pl. Cyl.
10"x36" Norton Type C
10"x36" Norton Type C Cam Gdr.
14"x48" Landis Type C Plain
14"x48" Landis Univ.
16"x36" Norton Type C Pl.
16"-36"x72" Norton Pl.
16"-46"x48" Landis Type D Pl.
18"x120" Norton Type A Plain
20"-32"x144" Norton Gap
20"x192" Norton Type A Plain
24"x264" Norton Type A Plain
No. TG615 J. & L. Thread Grinder
No. 81 Heald Int. Centerless
No. 74 Heald Int. Centerless
No. 72-A Heald Univ. Int.
No. 72A5 Heald Int. (1942)
No. 5 Bryant Internal
No. 5A Bryant Hole & Face
No. 5B Bryant Internal
No. 16-16 Bryant Internal
No. 16-28 Bryant Internal
No. 16A16 Bryant
No. 16A-28 Bryant Internal
No. 16F-28 Bryant Internal
No. 16-38 Bryant Internal
No. 24-26 Bryant Internal
No. 24-36 Bryant Internal
No. 24L-36 Bryant Internal
A3-16 Arter. Surf. (1942)
No. B24—25" chuck Arter Surf.
No. 214 Besly Dbl. End Disc
#8 Badger Hanchett Double End Disc.
Hill-Clarke Cyl Norton Type M.D.
16"x36" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x50" centers
14"x72" centers
14"x96" centers
18"x96" centers
18"-30" gap x 96" centers

LATHES

12"x21" Fay Automatic
16"x21" Fay Automatic (1944)
16"x33" R-14 Seneca Falls
16 ML 16 LeBlonde Semi-Auto.
18"x51" cc American Grd. Hd.
27"x84" cc American Geared Hd.
36"x120" cc Putnam Geared Hd., M.D.
No. 2 Warner & Swasey Grd. Hd.
No. 5W Acme Universal
No. 6 Warner & Swasey, bar fd.
No. 7A Jones & Lamson
No. 1A Warner & Swasey
No. 2A Warner & Swasey
No. 3AL Gisholt Cross Slide
No. 3H-10 Libby International
No. 3A Warner & Swasey Turret Lathe
No. 4A Warner & Swasey M.D.
No. 4A Warner & Swasey (1944)

MILLING MACHINES

No. 2HL K. & T. Milwaukee Plain
No. 4 Cincinnati Dial Type Plain
No. 08 Cincinnati Vertical
118 Van Norman Hyd. Mfg. (1942)
Model A Briggs Mfg.
54"x30"x16' Ingersoll Slab
10"x60" Pratt & Whitney Thread
12"x102" HT Lees-Bradner Thread
Model CT Lees Bradner Thread Mill (1942)
No. 118 Van Norman Hyd. Mfg.
No. 1-18 Cinn. Mfg.

PLANERS

48"x36"x11' Gray
60"x48"x27' American, 4 heads

MISCELLANEOUS

No. 2L-6 La Pointe Horiz. Hyd. Broach
8 Spdl.—6" Goss & DeLeeuw Chucker
No. 56 Sundstrand Double End Cent. Mach.
Foote-Burt 1 Spdl. Boring Mach. (1941)
15" Dill Slotter
18" Dill Slotter
Model 200 Micromatic Hor. Hone
Model H-7 Micromatic Vert. Hone
No. 224 Barnes Vertical Hone
No. 306 Barnes Vertical Hone
No. 6 R. & K. Straight Side Press
15 Ton Amer. Hyd. Press
42"-ga. Economy Shear, M.D.

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LATE MODEL TOOLS

No. 2M1 CINCINNATI Vertical Mill, latest type, new 1951

No. 4CH KEARNEY & TRECKER Vertical Mill, latest type, new 1951

No. 6 REED PRENTICE Die Sinker & Vertical Mill, No. 50 taper, table 20"x84", New 1941.

No. 7A JONES & LAMSON Turret Lathe, pre-selector head, bar feed, chuck, new 1942

18"x54" centers NEBEL Lathe, 8 speeds, 5 HP motor, new 1942

20"x10' centers SIDNEY, 3 & 4 jaw chucks, taper attachment, 7½ HP motor, new 1943

4'-9" column CINCINNATI BICKFORD Super Service Radial Drills, brand new, still in factory crates

6'-15" Column FOSDICK "Economax" AC Motor on Arm

6-19" Column CARLTON, AC Motor on Arm

78" BETTS Fixed Rail Boring Mill, new 1943

42" BULLARD Vertical Turret Lathe, 2' extra high column, new 1944

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10'-16' CINCINNATI Hypro Extension Vertical Boring & Turning Mill, Late Model and Like New. Motor Drive.

6'17" AMERICAN "Hole Wizard" Radial, new '48.

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POWER PRESSES all types, 1-1000 ton
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WIRE WORKING MACHINERY, Wire Drawing, Straightening and Cutting 4-Slide Wire Forming Machines
ROLLING MILLS, SLITTING MACHINES
BOLT & NUT MACHINERY
ROLL FORMING MACHINES
MACHINE TOOLS
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NATIONAL MACHINERY EXCHANGE
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EQUIPMENT WANTED

WANT TO BUY
HEAVY DUTY ENGINE LATHE
32" to 36" Swing Over Bed
24'-0" to 30'-0" Between Centers
Two Carriages on Bed with Rapid Traverse
Not Over 10 Years Old
THE MURRAY COMPANY OF TEXAS, INC.
P.O. BOX 7763 DALLAS 26, TEX.

WANTED
INGERSOLL PLANER MILLER
Must be 1938 or later—either 3 or 4 heads—42" up to 60" right to left—42" up to 60" under rail—approximately 20' table feed.
BOTWINIK BROTHERS OF MASS., INC.
3 Sherman St. Worcester, Mass.

WANT TO BUY
#6 HORIZONTAL TYPE PLAIN MILLING MACHINE
CINCINNATI OR EQUAL MAKE
Machine to have not less than 60" Table Travel
And Not Over 10 Years Old
THE MURRAY CO. OF TEXAS, Inc.
P.O. Box 7763 Dallas 26, Tex.

PLAN FOR "55" WITH MOREY
AMERICA'S LARGEST STOCK
NEW-USED-REBUILT MACHINE TOOLS

AUTOMATIC SCREW MACHINES
CLEVELAND 5¾" single spindle; late type
CONOMATIC 1⅞", 8-spindle; M.D., late type
NEW BRITAIN GRIDLEY Model 665; 6-spindle chucker; latest type; new 1943.

BORING MILLS—Horizontal
JIG BORERS
DEFIANCE Boring Mill 3¾" bar; late type
DIXI type 60 Swiss Jig Borer; 2.362" bar; late type
FOSDICK #30A Jig Borer; late type
GIDDINGS & LEWIS 340-T; 4" bar; late type
HEALD 49, double end Borematic; M.D.
HY-OP #5I Jig Borer; late type
LUCAS #21 2½" bar; table type
NILES 8" bar; floor type; motor drive
UNIVERSAL "Tri-Way" 3" bar; late type

BORING MILLS—Vertical
BULLARD 6', 8-spindle & 16" 6-spindle Type "D" Mult-au-matic; late type
BULLARD 24" spiral drive; PRT; late type
NILES 53", 2 swivel heads, PRT; M.D.
NILES 100" 2 swivel heads, PRT; M.D.
SELLERS 144", 2 swivel heads on cross rail; PRT

BROACHES
CINCINNATI 1-30 Duplex Vertical cap. 1 ton 30" stroke; Hydraulic; late
COLONIAL VGI-10-48 Vertical; Hydraulic; late type
LAPOINTE 10-54" Vertical, Model SRV; new 1947
OILGEAR 3XA horizontal; cap. 20,000 lb; 56" stroke; hydraulic; late type
OILGEAR type XL-6 single ram; late type.

DRILLS—Manufacturing
AVEY #2—2 spindle high speed, motor drive, late
BARNES #262 Heavy Duty Camel Back; late type
BARNES H-2 Hydram; 2" cap.; 22" swing; hydraulic
CLEVELAND "A" 5¾" single spindle; late type
LELAND-GIFFORD 1LMS, 4-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 2-spindle, M.D.; late
LELAND-GIFFORD 2LMS, 4-spindle, M.D.; late
NATCO B-4-B "Hole Steel" 60 adj. spindles; late
NATCO B-3-B "Hole Steel" 12 adj. spindles; late
NATCO E-5 high speed, 10 adj. spindles; late

FELLOWS GEAR EQUIPMENT
FELLOWS No. 6 High Speed Gear Shaper; late
FELLOWS No. 48 High Speed Gear Shaper; Internal cap. 72" diameter; late type
FELLOWS No. 61A & 615A High Speed Gear Shaper
FELLOWS No. 672 High Speed Gear Shaper; late
FELLOWS No. 7A, No. 72 and No. 75 High Speed Gear shaper; late type
FELLOWS No. 13 LS Lapper; motor drive, late
FELLOWS 20-M Red Liner; New 1954
FELLOWS 24-M Involute Measuring Machine; 1954

GLEASON GEAR EQUIPMENT
GLEASON 3" Spiral Gear Generator; late type
GLEASON No. 7 Hyp. Cutter Sharp; latest type
GLEASON No. 13 Hyp. Cutter Sharp; latest type
GLEASON 12" Spiral Bev. Cutter Sharpener; M.D.
GLEASON 12" Straight Bevel Generator; late type
GLEASON #16 Hypoid Gear Generator, motor drive.
GLEASON No. 18 Gear Tester and Lapper; M.D.
GLEASON No. 20 Spur Gear Tester; latest type
GLEASON 25" Straight Bevel Gear Gen.; M.D.
GLEASON 24" and 37" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Gen.; M.D.
GLEASON No. 6 Revacycle 5" cone distance; late

GRINDERS, Cyl. Plain & Univ.
BROWN & SHARPE #3 Univ. motor drive, late type
CINCINNATI 14"x72" Universal; M.D., late type
CINCINNATI 6"x18" Mod ER Plain, "Filmatic"; late
CINCINNATI #2 Centerless, Model EA Filmatic; late
LANDIS 20"x144" Plain Cyl. gap type, M.D., late
LANDIS 4"x12" Type H Hydraulic; late type
LANDIS 10"x18" type C Plain, Hydraulic, late
LANDIS 10"x36" type DC plain hydr. with infeed; late
LANDIS 16"x36" type "C" Universal, M.D. late
LANDIS 20"x144" Plain Gap Grinder; late type
NORTON 4"x12" Model CTU Plain, year 1953
NORTON 6"x18" Type "C" Plain; late type
NORTON 10"x48" Type C Hydr. Plain Cyl; late type
NORTON 16"x72" Type "C" Plain; late type

GRINDERS—Internal
BRYANT #5 Internal, hydraulic, late type
BRYANT #16-C-16 Internal, Hydraulic, late
BRYANT #24—36" Internal, hydraulic
HEALD #70A Internal, motor drive, late type
HEALD #78 Centerless; motor drive; late
HEALD #81 pl. chuck type, hydraulic; New 1947

LATHES, Turret
GISHOLT #1L and #2L Saddle type; Timken; late
GISHOLT #3 Universal ram type; M.D., late type
LIBBY #4H, 12" hole, motor drive, late type
MOREY #2, #3, #4, #5, ram type; Timken; latest
WARNER & SWASEY #1-A Universal; Hex., late

LATHES, Engine & Mfg.
AMERICAN 16"x102" centers, "Pacemaker"; late type
AMERICAN 36"x25' c.c., PRT; 2 cross slides; late
GISHOLT #12 Hydraulic Automatic; motor drive; late
HENDEY 24"x36" centers; motor drive; late type
HENDEY 16"x72" centers; M.D., late type
LeBLOND 20"x48" centers, Timken; M.D., late type
LODGE & SHIPLEY 12"x30" centers, Toolroom
LODGE & SHIPLEY 14"x30" centers; late type
MONARCH Model EE 10"x20" centers, Toolroom; late
MONARCH 12"x30" centers; Model CKK; late type
MONARCH 16"x54" Centers, Motor Drive
MONARCH 16"x78" centers, Model CW, Timken, late
MONARCH 16"x78" c.c. Model CW; Timken; late type
MONARCH 20" (raise to 3½") x 144" c.c., late type
NILES 30"x50' bed, single and boring, "Time Saver"
NILES 30"x100" c.c. Geared Head; Timken; late
NILES 36"x100" centers "Time Saver"; motor drive
PRATT & WHITNEY 16"x30" centers; Timken, late
SPRINGFIELD 20"x40" c.c., motor drive; late type
SUNDSTRAND 10"x60" centers; auto Type B; late

MILLING MACHINES, Plain
BROWN & SHAPPE #10, motor drive; late type
CINCINNATI 1-18 Production; Timken; late type

MILLING MACHINES, Thread
HALL Style "D" Planetary; late type
LEES BRADNER Model #LT 6"x30" and 8"x72"; #HT 12"x24" and #HT 12"x36" centers; late type
MOREY 12"x30" and 12"x100" centers; late type

MILLING MACHINES, Vertical
CINCINNATI #4 High Speed Dial type; late
CINCINNATI 0-8 Vertical; Timken; late type
CINCINNATI #3 Dial Type; High Speed, New 1953
KEARNEY & TRECKER 3K late
MILWAUKEE #4-H Vertical; late type
STEINEL SV4d, #30 taper, 6 spindle speeds; latest

PLANERS
GRAY 48"x48"x10' "Maximum Service" 4 hds; PRT; DC; Reversing, Late type
LIBERTY 144"x76"x48" adj. openside; box table; 4 hds; vari-voltage; PRT; New 1940
NILES-BEMENT-POND 72"x72"x30"; 4 hds; PRT; DC; M.D.
SOUTHWARK plate-edge Planer; 16 ft; late type

PRESSES
BLISS #410A, 825-ton double action toggle drawing press; M.D.
NATIONAL #5 "Maxi-Press", 1000-ton cap. H.B. Forging Machine; M.D.
SHAW 250-ton Hydraulic flanging press; late type
WATERBURY FARREL #9, 125-ton cap., M.D.

SHAPERS
CINCINNATI 20"; motor drive; late type
GOULD & EBERHARDT 32"; High Speed; M.D.
HENDEY 12" High Speed Univ. Crank Shaper; late
MOREY 8" Vertical; motor drive; late type

MISCELLANEOUS
ALEXANDER #2, 3-dim. Engraving NEW 1952
AVEY No. 2, 2-spindle Drill Press; late type
BARNES No. 172 Honing; M.D., hydr.; late type
HILLES & JONES #7 Plate Bending Roll; capacity 2¼" x 16'; motor drive
LeBLOND No. 2 Deep Hole Reaming, late type
LeBLOND No. 2 Deep Hole Rifling, late type
HUGH SMITH cap. 1" thick plate x 25' between housings-Plate Bend. Roll, M.D.

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72" Niles Bement Pond Vert. Boring Mill — older but good.
54" Bullard Serial 11488.
No. 47 Heald Single End Borematic Serial #4646
3" Tri-way Univ. Boring Mill Ser. T-2430.

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LATHES

27"x18' MONARCH "N" Geared Head Lathe, 11' centers, Taper Attach., Full Equipment, Late Type, 1942.

18"x10' MONARCH "BB" Grd. Hd. Lathe, 72" centers, Taper Attach., Flame Hardened Bed, Late Type.

24", 36", 42" BULLARD Vertical Turret Lathes, New Era, Turret Hd., Side Hd. M.D.

No. 2, 4, 5, 1A, 4A WARNER & SWASEY Univ. Turret Lathes, Bar Feed.

24"x10' AXELSON Geared Hd., H.D. Model "E" 28" Actual Swing, M.D., Taper Attach.

No. 7 BARDONS & OLIVER Universal Turret Lathe, 2½" capacity. Preselector Head.

25"/50"x12' LeBLOND Sliding Bed Gap Lathe, Geared Head.

MILLING MACHINES

No. 2-18 CINCINNATI Plain Auto. M.D., Late

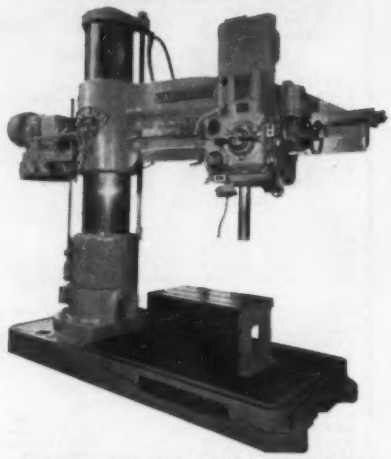
No. 2 BROWN & SHARPE Vert. Mill, Light Type, Swivel Head, M.D., Late.

No. 1-8 KENTS OWENS Hydraulic Horiz. Mill, Late Type, M.D.

6' arm x 17" column FOSDICK Economax Hydraulic Radial Drill, Motor on arm, late type. 1944

4'x15" CARLTON Radial Drill. Motor on arm.

DRILLING MACHINES



6' ARM x 19" COL. CARLTON RADIAL DRILL, 20 HP., LATE TYPE, 1943

No. 262 BARNES Motor Driven Sliding Drill Press, 2" cap. in steel, 1941.

No. 2 M. T. Six Spindle ALLEN Type KH Drill Press, Individual Motor Drive, Late Type.

400 tons CHAMBERSBURG Hydraulic Wheel Press, 14" Ram, 96" between Tie Bars, 12' to End Support. M.D.

No. 0, 1, 2 BUFFALO FORGE Vertical Angle Bending Rolls, M.D.

No. 6 FEDERAL O.B.I. Press, 65 tons, cap., single geared, 4" stroke, M.D.

½, 1½ BUFFALO FORGE Universal Ironworker, Notcher and Coper, M.D.

36" ROCKFORD Hydraulic Openside Shaper, with Side Head, Late Type.

No. 20 WATERBURY FARREL Thread Roller, ⅜" cap. 1944, Motor Driven.

No. 8LS FELLOWS M.D. Gear Lapping Machine. Detachable Head, Univ. Work Support.

No. 00G BROWN & SHARPE High Speed Automatic Screw Machine. M.D. Late type.

10"x10" RACINE #30-C Hydraulic Heavy Duty Shear Cut Power Hack Saw, 1946.

10' x ¼" WYSONG & MILES Power Squaring Shears, Motor Driven.

GRINDERS

30" INGERSOLL Face Mill Cutter Grinder, M.D.

6" x 18" LANDIS Type "C" M.D. Hyd. Cylindrical Grinder, Serial #29196.

#3 Brown & Sharpe Univ. Cyl. Grinder, M.D.

#TG615 JONES & LAMSON Thread Grinder, Lathe, M.D. and TG848.

No. 208 BESLEY Motor Driven Disc Grinder, 26" wheels, Late Type.

No. 194 BARNES Vertical Hone, 4" capacity, 12" stroke, Motor Driven.

5" UNIVERSAL HORIZONTAL BORING, MILLING, DRILLING MACHINE. TABLE TYPE, 55" x 91" Table, 24 Spindle Speed 7.0 to 850 RPM. NEW in 1948.

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Serial #647
Excellent Condition

Stroke .....24"
Shut Hgt. on Bed.....40"
Bed Area (R to L x F to B).....55" x 60"

Equipped with 75 HP Drive Motor & 7½ HP Ram Adj. Motor, 3 Phase, 60 Cycle, Marquette Air Cushion

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BORING MILLS, 84" King, 3 Hds., 1943
54", 42" & 24" Bullards
4½" Bar Sellers, Floor Type
4" & 3½" Bar Landis, Floor Type (2)
3¾" Bar Defiance Tble Type, Late
3" Bar Universal, Tble Type.
GRINDERS, 12"x48" & 16"x96" Landis, Late (2)
60" Hanchett Vert. Spin. Surf., Hyd.
RADIAL DRILLS, 413" Col. Cinci. Bick., '44
5'15" Col. Carlton & Amer., M.-op-arm
GEAR SHAPERS, Nos. 645A3, 61A, 61 Fellows
KEYSEATERS, Nos. 5, 4 & 2 M. & M.
LATHES, 16"x154" Con. Hendey, T.A., Tim.
GEAR HOBBER, 80" Capty. Pfauter, No. 4
SHAPERS, 32" Cinci., '41, 24" Cinci. Univ., '40
SLOTTERS, 20"-24" & 12" Dill-Lobdells

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SURPLUS EQUIPMENT

Practically New Bellows Drill Units, Air Motors, Transformers, and Rotary Feed Table; Syntron Feeders and Vibratory Hopper; New 3 Spindle Attachment for No. 2 Swiss Automatic Screw Machine; Lees-Bradner Cri-Dan "D" Threading Machine and Milwaukee 4B Plain Milling Machine.

PLOUGH, INC., Memphis, Tenn.

No. 2 B & S H.S. Automatic, M.D.
Gleason 3" Str. Bevel Gear Generator.
Bryant No. 5 Internal Grinder.
No. 3A B & S Universal Mill, M.D.

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ELECTRIC FURNACE TO 1850°

with Auto Temperature Control. Sliding door. Cheap to operate. Substantial Dependable for Machine Shop Tool Room.
8" x 12" x 15" inside 4.5 K.W. $300.00
12" x 16" x 20" inside 9.0 K.W. $500.00

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BORING MACHINERY
No. 2 P&W Jig Borer, Serial 323.
36" Bullard New Era vertical T/L
42" Bullard New Era vertical T/L

DRILLS, RADIAL
4' arm 13" col. Fosdick Economax, 1941.
9 ft. arm 16" column American, M.O.A.

GRINDERS
4"x18" Cincinnati pl. hyd., plunge cut, 1946
6"x18" Landis "C", 30 deg. head, 1941
10"x18" Cincinnati filmatic, type ER (2), 1941-1945
12"x36" Cincinnati ER Univ. cylindrical, new 1941.
14" Standard Electric twin-wheel carbide grinder, late.
14"x36" Landis type C, hydraulic (2). 1946
16"/26"x72" Norton type C, hydraulic, 1945
16"/40"x120" Landis gap type, hydraulic, serial 16193
12" Model 22 Heald rotary surface, 1942
16A2 Blanchard rotary surface, serial 6046. 1946
14"x36" P & W vert. surface grinder, 1942
72" No. 72 Hanchett rotary surface, 1946

LATHES, ENGINE
10"x18" Hendey toolroom, serial 29620
14"x42" Hendey G.H., M.I.B., 1940
24"x14 ft. bed American G.H., Q.C.G., serial 44070
24"x20' bed LeBlond heavy duty, DC motor, older
54"x30' bed Pond, DC motors, older.

LATHES, MFG. & MISC. & TURRET
15"x30" Lipe Carbo-Matic, 1942
17"x72" LeBlond Rapid production (5). 1946-1947
No. 5 Jones & Lamson Universal ram type turret lathes, (2) late models

MILLING MACHINES
No. 2 Cincinnati Hi-power plain horiz.
No. 4 Cincinnati Hi-power plain horiz.
No. 5 Cincinnati Hi-power plain horiz., vert. attach.
No. 4-36 and 4-48 Cincinnati Hydromatic production
No. 3B and 4K Kearney & Trecker plain. late type
No. 3K Kearney & Trecker universal dial type.
No. 3H Kearney & Trecker plain horiz., new 1942.

PLANERS
30"x30"x10' Cincinnati, 7½ H.P.-M.D.
48"x48"x10' Gray Maxi-Service, P.R.T.
36" Rockford hydraulic openside shaper-planer
66" Rockford hydraulic openside shaper-planer.

PRESSES
600 Ton No. 90-600 Minster K-J Coining, new 1941.
125 Ton No. 6 Bliss S.S., D.C.
545 Ton 3612½ Hamilton S.S., S.C.
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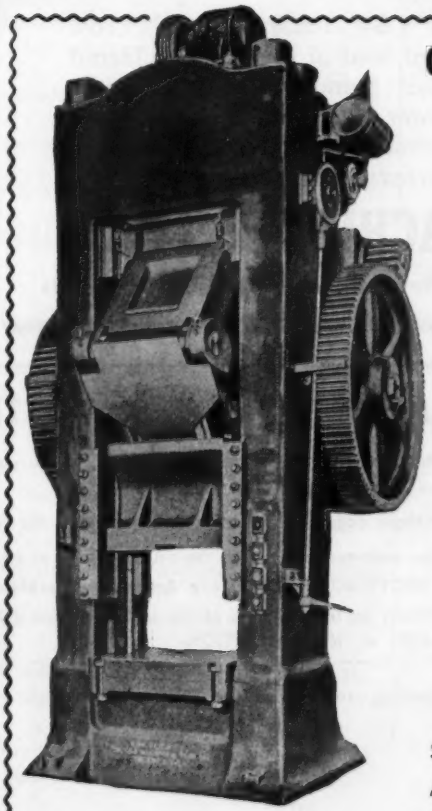

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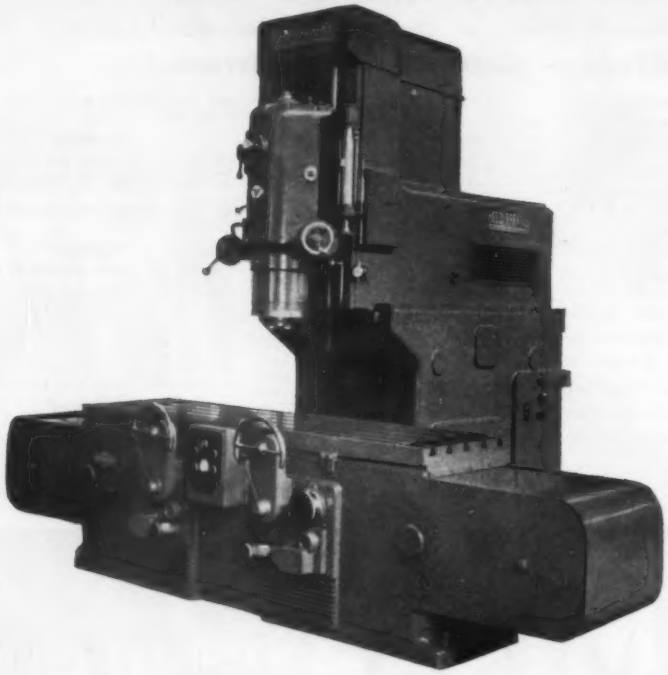

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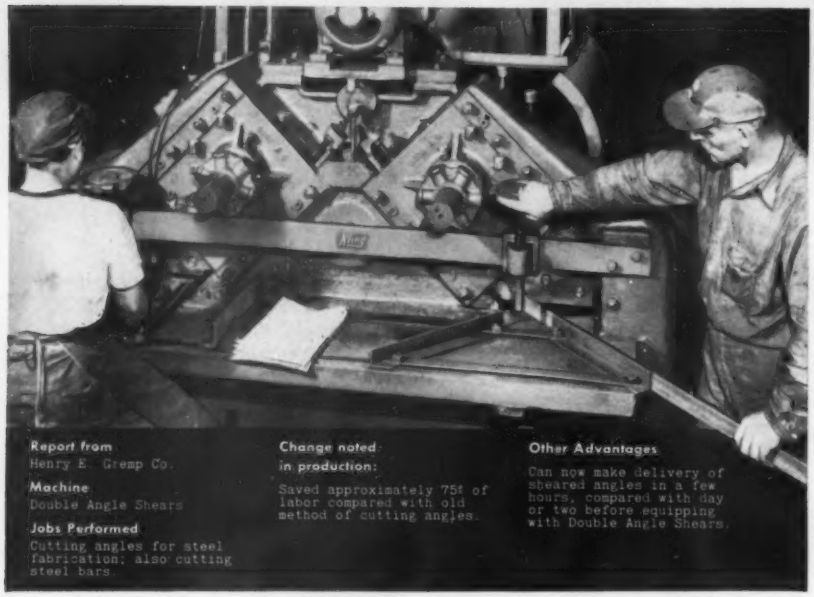
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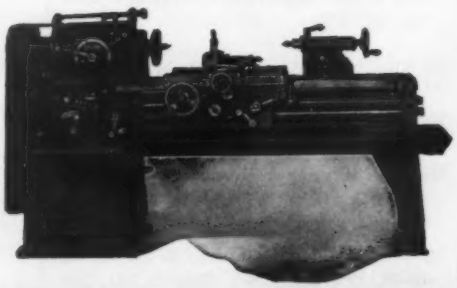

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Does 5 Operations without removing cutter from its ARBOR!

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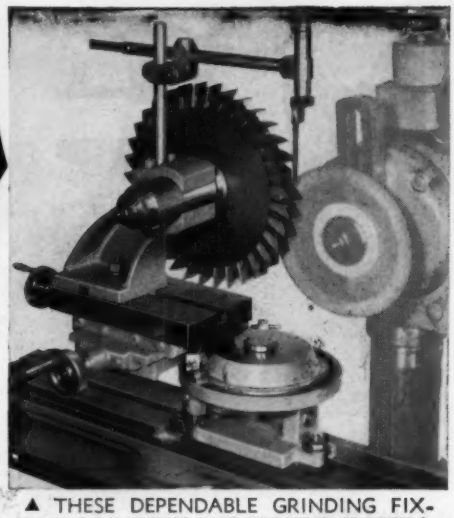

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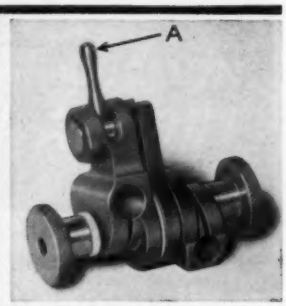

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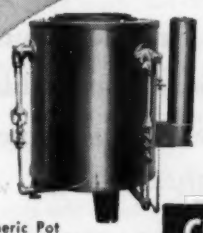

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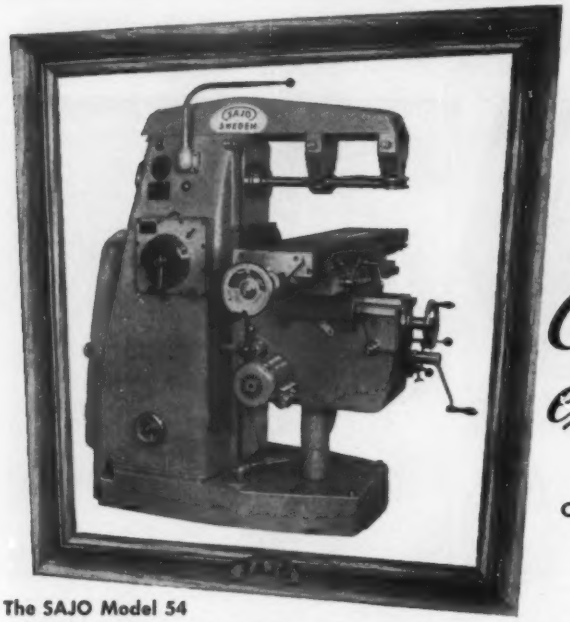

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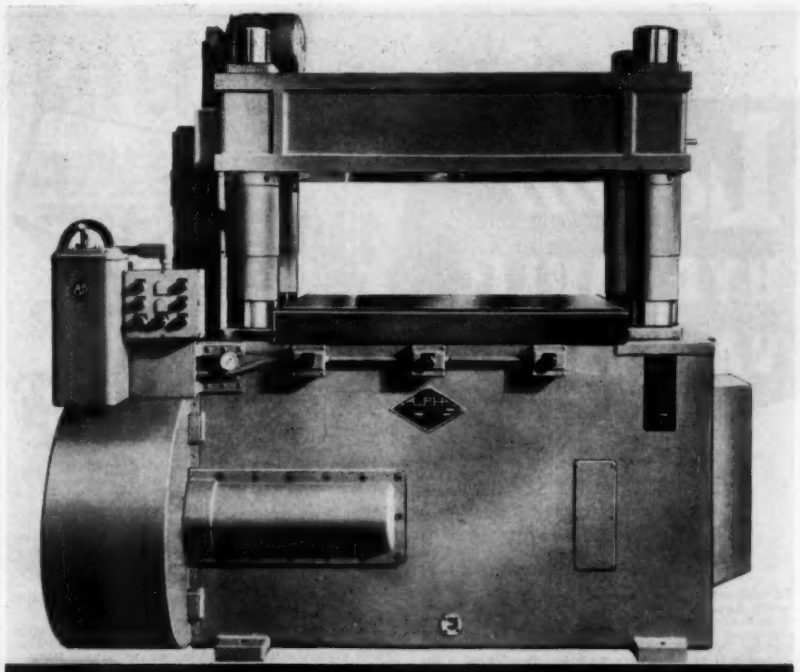

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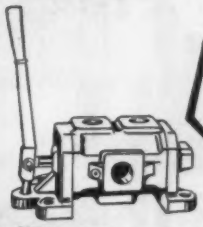
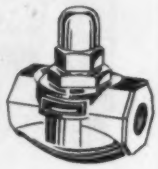


Illustrated, Model 4095 —4-way, 2-position valve for directing pressure alternately to ends of double-acting hydraulic cylinder.

Illustrated, Model 8015 adjustable speed control valve. Install between operating valve and one end of cylinder to meter flow of oil in one direction with free flow on return.



A broad range of types and sizes to most effectively meet any requirement—Design Engineers, Machine Operators, Maintenance Men appreciate these Logan advantages

- LONG-LIFE CONSTRUCTION
- EASY TO SERVICE
- INFREQUENT MAINTENANCE
- EASE OF INSTALLATION
- EFFORTLESS OPERATION
- UNRESTRICTED PORTING

On your products and in your plant, the enlarged line of standard Logan Hydraulic Control Valves offers many profitable advantages in selection, installation, use and maintenance. Standard Logan Hydraulic Valves are designed for 1500 psi service. The broad range of types and sizes makes it easy to select the most effective valve for every problem.

Balanced-pressure construction of these piston-type valves places identical pressure on both ends of the piston, thus providing effortless operation.

All ports and internal chambers are full pipe size with valve piston light in weight, thus assuring rapid response and fast reversal without excessive vibration or wear.

Highly compact design permits easy installation in restricted areas. Master control valves have four mounting feet located on end covers for easy mounting.

The valve body, which includes the ports, can be rotated 360° on the end covers to four positions at 90° intervals, when socket-head cap screws are removed from the covers. Permits convenient and efficient location of pipe connections. Alternate inlet ports, with one port plugged, provide added flexibility.

The ease with which pipe connections can be made often eliminates the necessity for costly special valves. Elimination of elbows, street ells, bends, etc. minimizes internal friction, thereby increasing efficiency and reducing costs

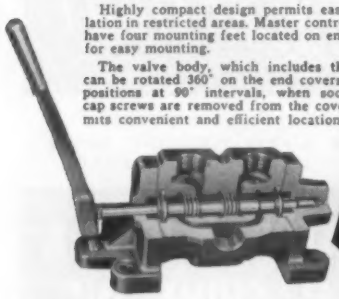
The tough, wear-resistant alloy steel piston, hardened and ground, provides a close, sliding fit in the valve body. Both body and end covers are chrome nickel iron castings which furnish a good bearing surface to assure superior wearing qualities.

Both wear and maintenance are reduced in the Logan sliding-piston construction through elimination of valve seats and packing. The two stem seals at ends of piston are subject only to exhaust pressures.

With the removal of end covers, the standard seals are easily replaced and the piston may be removed from the valve body for examination without disconnecting the piping.

Logan Hydraulic Control Valves offer many other advantages which assure longer, more effective performance and low maintenance.

For full information write for Logan Catalog 200-4.



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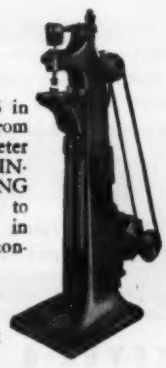

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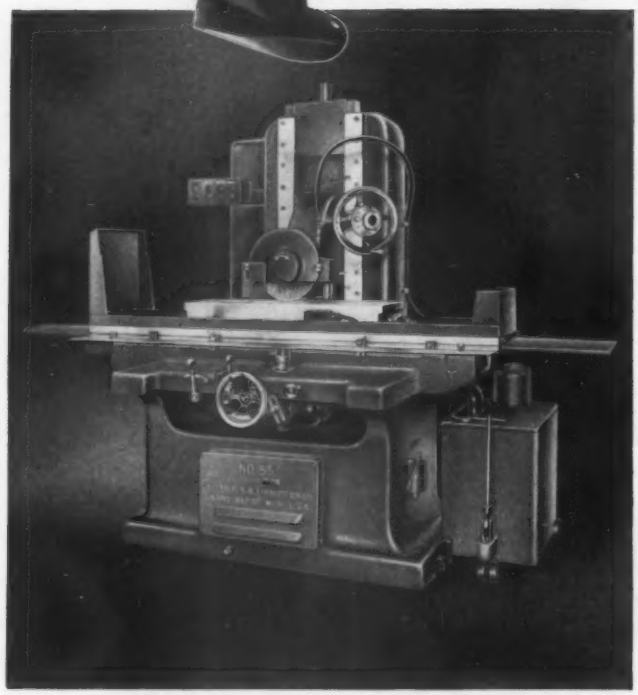

GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER
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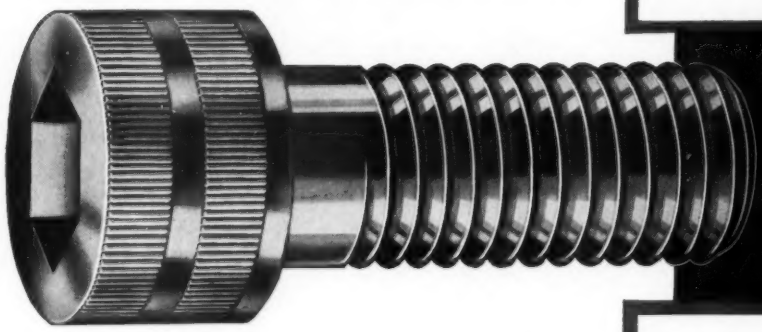

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For concentric head, shoulder and thread.

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Special finish is corrosion-resistant, facilitates driving.

"Old reliable" 21 in. sliding head floor drill stays accurate *with spindle on TIMKEN® bearings*

THE long-lasting precision of this Cincinnati 21" sliding head floor drill has earned it the nickname "Old Reliable". One reason for this precision: the spindle is mounted on Timken® tapered roller bearings which are supported in an accurately ground and graduated quill. Two tapered roller bearings support the quill and two support the spindle pulley.

Timken precision bearings are especially designed for spindle applications. Run-out tolerances can be held to a maximum of 75 millionths of an inch. Due to their tapered construction, Timken bearings take both radial and thrust loads in any combinations, hold spindle rigid, permit pre-loading to any desired degree to prevent chatter.

Because of line contact between rollers and races, Timken bearings provide adequate capacity for any tool load. And spindle accuracy can always be maintained because Timken precision bearings are adjustable.

Timken bearings have contributed to the development of precision machine tools for over 25 years. To get longer life with minimum maintenance, buy or build machine tools that are Timken bearing equipped. Always look for the trade-mark "Timken" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

CINCINNATI LATHE & TOOL CO. uses Timken precision bearings on the spindle of its 21" sliding head floor drill to insure long lasting spindle precision.

OUR OWN NICKEL-RICH ALLOY STEEL MAKES TIMKEN BEARINGS TOUGHER

Nickel makes steel tougher. And we don't skimp on nickel in the fine alloy steel we make for Timken bearings. Our steel-making specialists use the exact amount to give Timken bearings the toughness they need to withstand shock, last longer. We control the quality of Timken bearings at every step in production—from melt shop through final bearing inspection.

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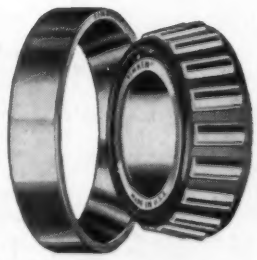

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION